AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

JUNE 15, 1956

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A New Concept of Diesel Engine Combustion
Heat Treating Steel for Heavy Duty Axles
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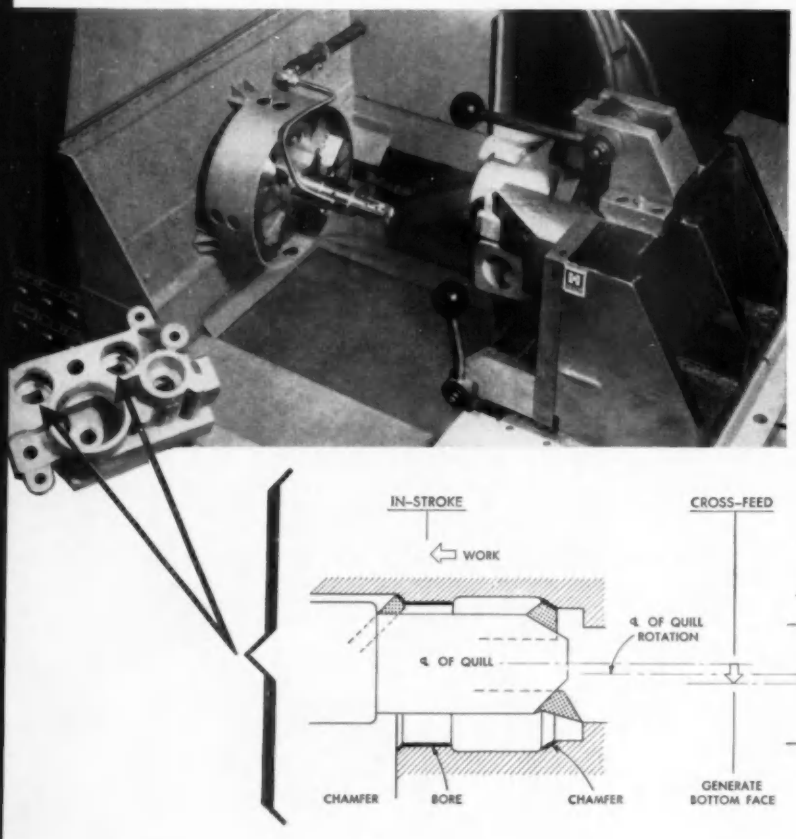
A CHILTON PUBLICATION

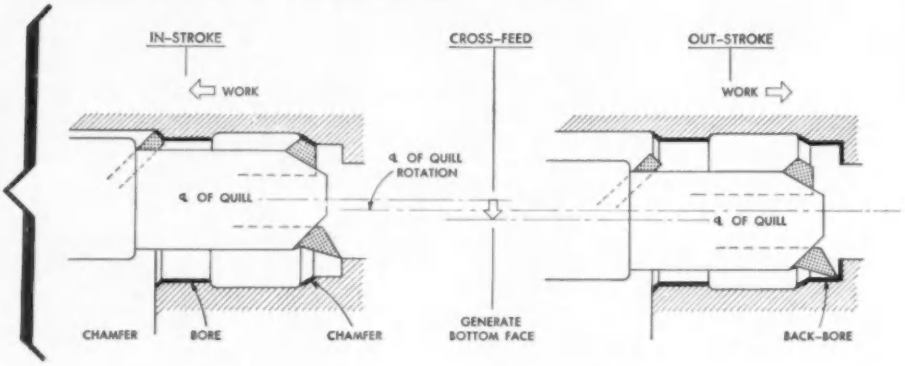
Heald BORIZING boosts production of aircraft filter bodies

from 8 PARTS PER HR.

to 33 PARTS PER HR.



another example of how a simple Borizing setup can do a better job, faster, and at much lower cost



THE fixture and tooling setup in the photo above looks like a very simple one — and it IS! Yet this single, three-point quill Borizes two chamfers, two I.D.s and a bottom face on each of two identical bores in an aluminum aircraft filter body, all in a single, fully-automatic cycle with only one chucking of the part.

As the diagrams show, the job is done with a cross feed unit on the Borizing quill to present the tooling to the work in the proper sequence. Auto indexing of cross slide positions work for Borizing the two identical bores in sequence.

Compared to the previous method of doing the same job, this Model 221 Bore-Matic increased production from 8 parts to 33 parts per hour, with closer tolerances, better finish, easier operation and less maintenance.

The *simplicity* and *versatility* of Heald Borizing permits important savings on an almost unlimited range of work and finishing operations. Another big reason why it *pays* to come to Heald.

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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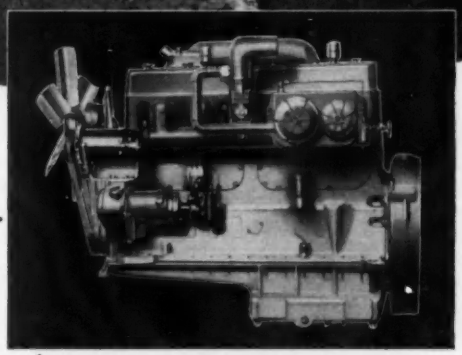
Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

HEALD ®

This fast traveling truck, powered with a Waukesha Super Duty Six, moves more material, most economically, in mining service.

WAUKESHA

for fast, heavy hauls



Powering the truck — Model WAKR Butane Super Duty Six—6¼-in. bore x 6½-in. stroke, 1197 cu. in. displacement, 290 horsepower at 1800 rpm.

1197 cubic inch Super Duty ENGINES

all with counterbalanced crankshafts

WAKR Butane — **WAKDB** Normal Diesel — **WAKDBS** Turbodiesel

up to 352 maximum hp

This truck is one of sixteen in a mining company's fleet. Hauling 22-ton average payloads—up 6 to 8 per cent grades—off-the-highway most of the time—and they work a twenty-hour day. Only after 7000 hours or more of this heavy hauling mine service are the engines overhauled—a good average.

Let's look at this truck's power. It has a torque converter—automatic transmission combination—and the engine is one of the Waukesha 1197 cubic inch Super Duty Sixes. This is Model WAKR, burning butane. Built like the Super Duty Diesels in this WAK Series, except for cylinder heads and injection equipment.

Write for descriptive bulletins

308

50th ANNIVERSARY Waukesha MOTOR 1906-1956

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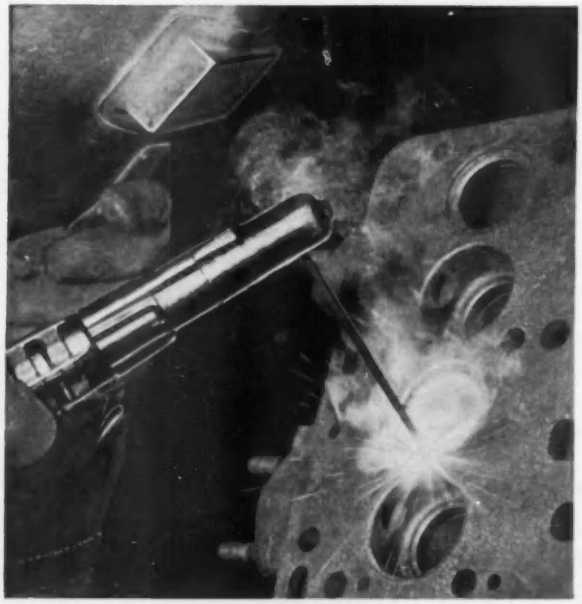
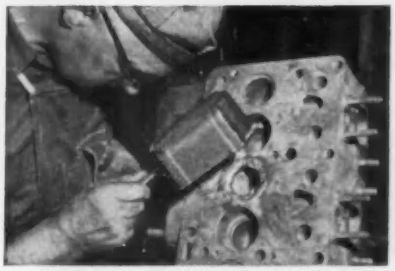
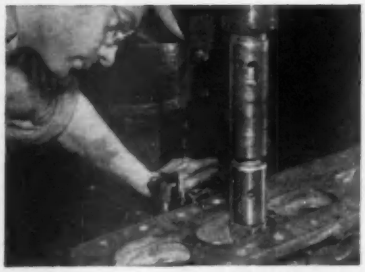


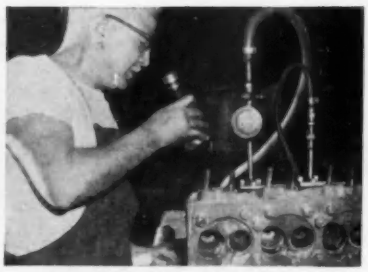
"Welding team" helps huge bus fleet save engine blocks

Ni-Rod and Ni-Rod "55" cut costs, simplify cast iron repairs

1. Good build-up — Worn valve seat on an engine from one of the 720 busses operated by Niagara Frontier Transit System of Buffalo, N. Y., gets built up with Ni-Rod electrodes. Before being welded, the oil-impregnated casting was degassed in an oven for a half hour at 900°F. Then it was cooled, wire-brushed and preheated to 400°F.







2. Like new with Ni-Rod — Valve seat weld gets close inspection. Then the seat is re-machined. And finally it's pressure-tested. At this point, the men charged with maintenance of this huge bus fleet consider the valve head as good as new. They give a lot of the credit to *the soundness and machinability* of Ni-Rod welds. Mr. W. W. Kunz, who heads the maintenance department says, "Using Ni-Rod and Ni-Rod "55" for repairs on 75 to 100 busses every year gives us a very substantial saving."

3. Chalk one up for Ni-Rod "55", too — A crack that's dangerously close to the cylinder liner gets marked for repair with Ni-Rod's companion electrode, Ni-Rod "55". For stiff sections, like this engine block, and for heavier sections, high phosphorous irons, Ductile Iron, Ni-Resist® and high-strength cast irons, welders choose Ni-Rod "55". Like Ni-Rod, you can often use it *without preheat or postheat.*

If you work with cast iron, you can use this "welding team" profitably in your operation, too.

With Ni-Rod® and Ni-Rod "55"® you can, like this bus company, save worn or damaged cast iron parts that otherwise you'd scrap; and you can also simplify cast iron assembly work.

Ni-Rod and Ni-Rod "55" electrodes are easy to handle. And even welders of limited experience can produce *sound, machinable welds.*

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

JUNE 15, 1956 — VOL. 114, NO. 12

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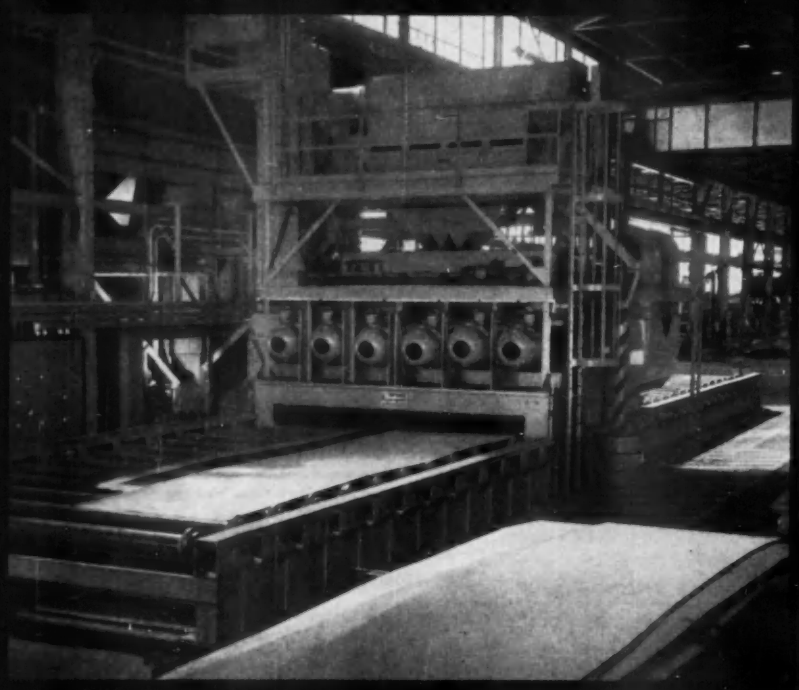
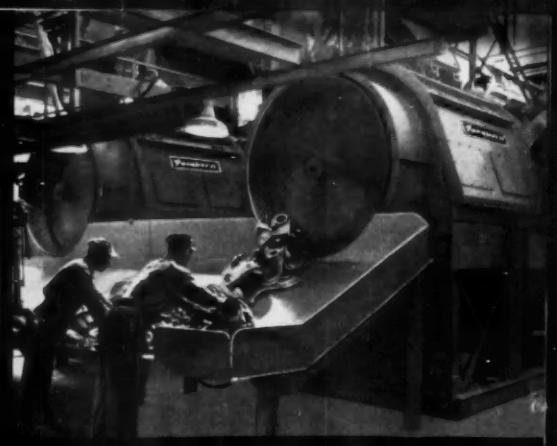
AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

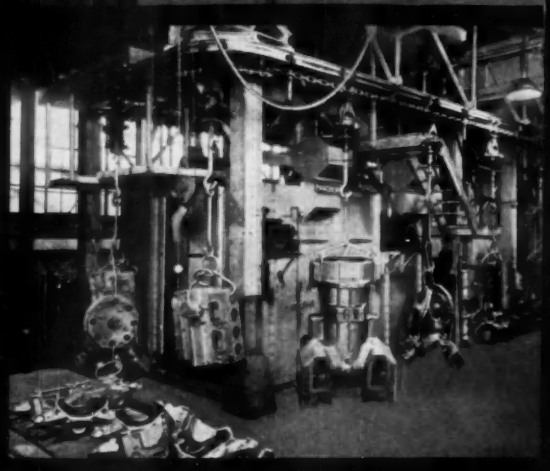
EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, United States Possessions, 1 year $2.00, 2 years $3.00. Canadian and Foreign, 1 year $5.00, 2 years $8.00; single copies, 25 cents, except Statistical Issue (Mar. 15th), $1.00

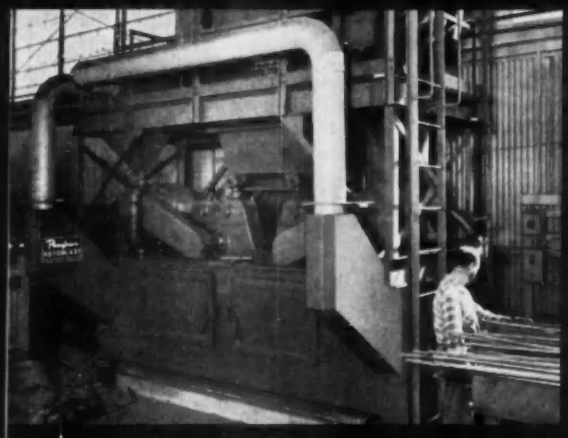
If you have







an unusual blast cleaning problem,



If you are a company with a special cleaning problem, Pangborn offers you a special service—a machine designed for your individual needs. It might be a descaling machine for bars, sheets and coils, a continuous-flow barrel or a monorail cabinet like the machines shown here . . . or it might be completely different. You may need to clean cylinder blocks, bathtubs or any unusual ferrous or nonferrous castings, forgings, stampings. If so, Pangborn engineers will study your problem and its relation to your production line. Then they'll design a Pangborn machine that gives you better cleaning and faster production at lower cost. Pangborn has proved it in hundreds of cases. Pangborn can prove it to you! Write today for Bulletin 1210 to: PANGBORN CORP., 3900 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

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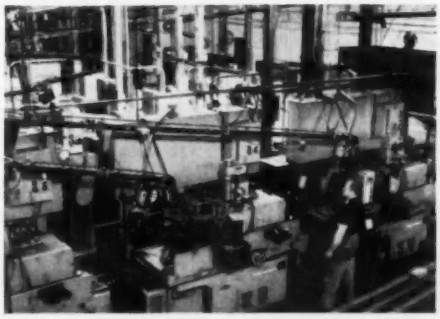

Photograph shows bearing races being fed through a conveyor into electronically controlled grinding machines on which the parts are ground to close tolerances. Electronic gauging, automatic feed-back and mechanical transfer of parts from one machine to another all contribute to the uniformity and consistent high quality of Hyatt automotive bearings.

GM GENERAL MOTORS

HYATT ROLLER BEARINGS

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Sun's Heavy Duty Emulsifying Cutting Oil excels on high-alloy aircraft steels

S.E.C.O. Heavy Duty handles all machining jobs requiring an emulsifying cutting oil. Piasecki Helicopter's large job shop at Morton, Pa., found this out three years ago when S.E.C.O. HD* replaced two expensive heavy-duty soluble oils in machining fan hubs.

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For more information about S.E.C.O. HD, see your Sun representative. Or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-6.

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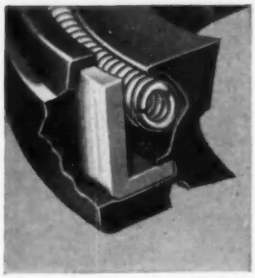

Type K4 with Victoprene on O.D.

For installations requiring sealing element on outer periphery and outside face, K4 seals are so designed. Otherwise, construction is identical with K6 seal as above.

The K6 offers you highly developed double lip design with integral metal O.D. case and supplementary edge sealing. Thoroughly proven on heavy-duty applications, this construction is the modern replacement for costlier compound element seals and multiple seal installations.

The K6's efficient dual function of sealing in lubricant and sealing out foreign matter permits maximum compactness in seal housing.

The sealing element is oil-, age- and heat-resisting Victoprene synthetic rubber. Exclusive Victor process of mechanical and chemical bonding combines the element and metal case into a permanent single-unit structure.

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The supplementary Victoprene edge compresses against shoulder on base to assure positive O.D. seal with metal to metal O.D. press fit.

Valley between sealing lips retains initial lubricant for minimum friction and longer sealing life.

Unitary construction for minimum width requirements. Available in minimum width of ¼ inch, and for shaft diameters up to 7 inches.

Available with or without garter spring on primary sealing lip.

External or secondary sealing lip, molded with initial light interference, permits satisfactory installation. Upon installation, the primary sealing lip displaces to increase sealing efficiency of secondary member through flex action.

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Six of nine Cleveland Worm Gear Drives in use on the Anvil Lift Drive of this Mesta Gag Press are in view.

Gag press uses 9 CLEVELAND drives to straighten steel

BIG equipment . . . doing a big job. Smooth, powerful, dependable speed transmission is vital here—and this gag press, designed and built by Mesta Machine Company, has it . . . thanks to 9 Cleveland Worm Gear Drives.

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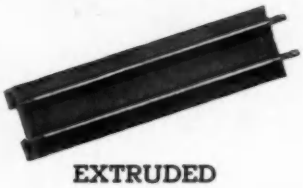

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How you can take advantage of Du Pont's new technical service on diesel problems

As you doubtless know, downtime of diesel engines is understandably serious to operators because it means loss of income. And performance complaints from big fleet customers can jeopardize a substantial amount of business.

Injector-sticking and filter-plugging are among the most annoying diesel engine operating problems. They involve the fuel composition as well as the engine design. In many cases, diesel fuel additives provide the easiest and most efficient solution. We at Du Pont are interested in cooperating with fuel suppliers on these problems.

To help you satisfactorily answer customer complaints, our Petroleum Chemicals Division automotive specialists will be glad to work with your own men. The practical experience which our men have had in working on this type of problem can be put to your use. And the facilities of our five conveniently located regional laboratories, as well as the Du Pont Petroleum Laboratory, can also aid you in this work.

In many cases of filter-plugging—in both truck and tractor fleets—our service representatives have found that Du Pont Fuel Oil Additive No. 2 (FOA-2), or a combination of FOA-2 and Du Pont Metal Deactivator (DMD) in the fuel will help prevent the trouble. FOA-2 has also solved injector-sticking problems in several types of diesel engines. However, since engine designs and diesel fuel stocks vary, each problem must be studied on an individual basis.

If your diesel engine customers are encountering fuel problems, we're sure it will pay you to talk them over with one of our automotive representatives. You can get in touch with one at any of our offices listed below.

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UNITED

Rectangular Diesel Air Cleaner Helps Crawler Tractors Breathe Easily

This new United Specialties rectangular diesel oil bath air cleaner provides major improvements in air cleaner design and operation. It is available for truck and tractor engines, and for industrial power units.

1. Meets Limited Space Requirements

Rectangular shape of air cleaner conforms better to engine shape — fits snugly under hood — makes most efficient use of available space.

2. Lower Installation Cost

Air cleaner outlet can be taken at any point around the perimeter of the clean air chamber, providing the shortest connection to manifold.

3. More Air Volume

The rectangular cleaner, with sides of the same length as the diameter of a circular cleaner, contains far more surface area. This helps slow down air velocity through cleaner, safeguards against oil carryover from cleaner to engine.

4. Simple Maintenance

Removable scrubber element can be easily detached for cleaning.

For the newest and finest in oil bath air cleaner protection, call on United Specialties. Our experienced sales engineers can help you with your air cleaner design problems. We invite your inquiry.

UNITED SPECIALTIES COMPANY

UNITED AIR CLEANER DIVISION — CHICAGO 28, ILL.
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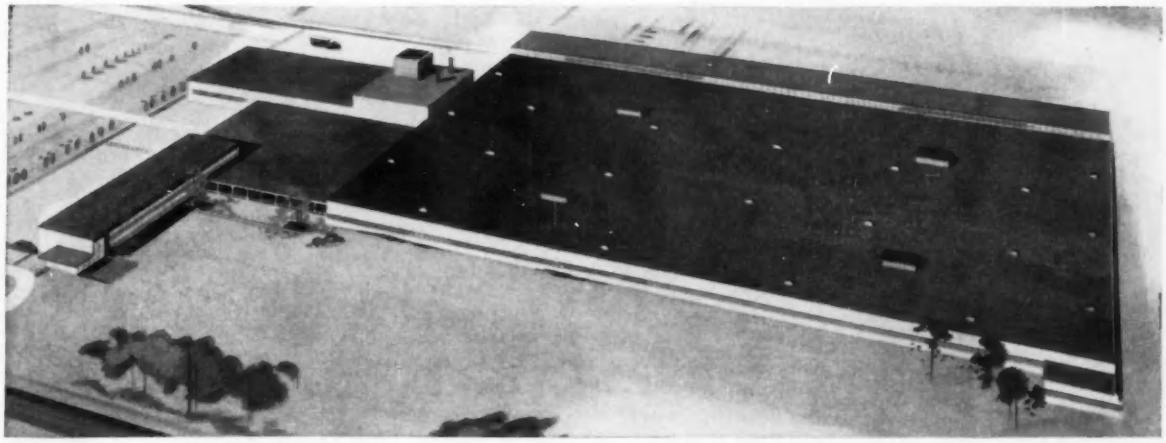
~~Coming soon~~...

its new and modern automotive

parts manufacturing facility



In just a few weeks now, Thompson will begin operations in its new, modern parts manufacturing facility now nearing completion in the Detroit area. This new plant will employ the latest methods and equipment available to provide low cost, efficient manufacture of chassis parts.

Chassis design improvement has become an increasingly important factor in the automotive industry's future planning. This, plus the tremendous acceptance of Thompson steering linkage and other chassis parts has made Thompson's latest expansion necessary.

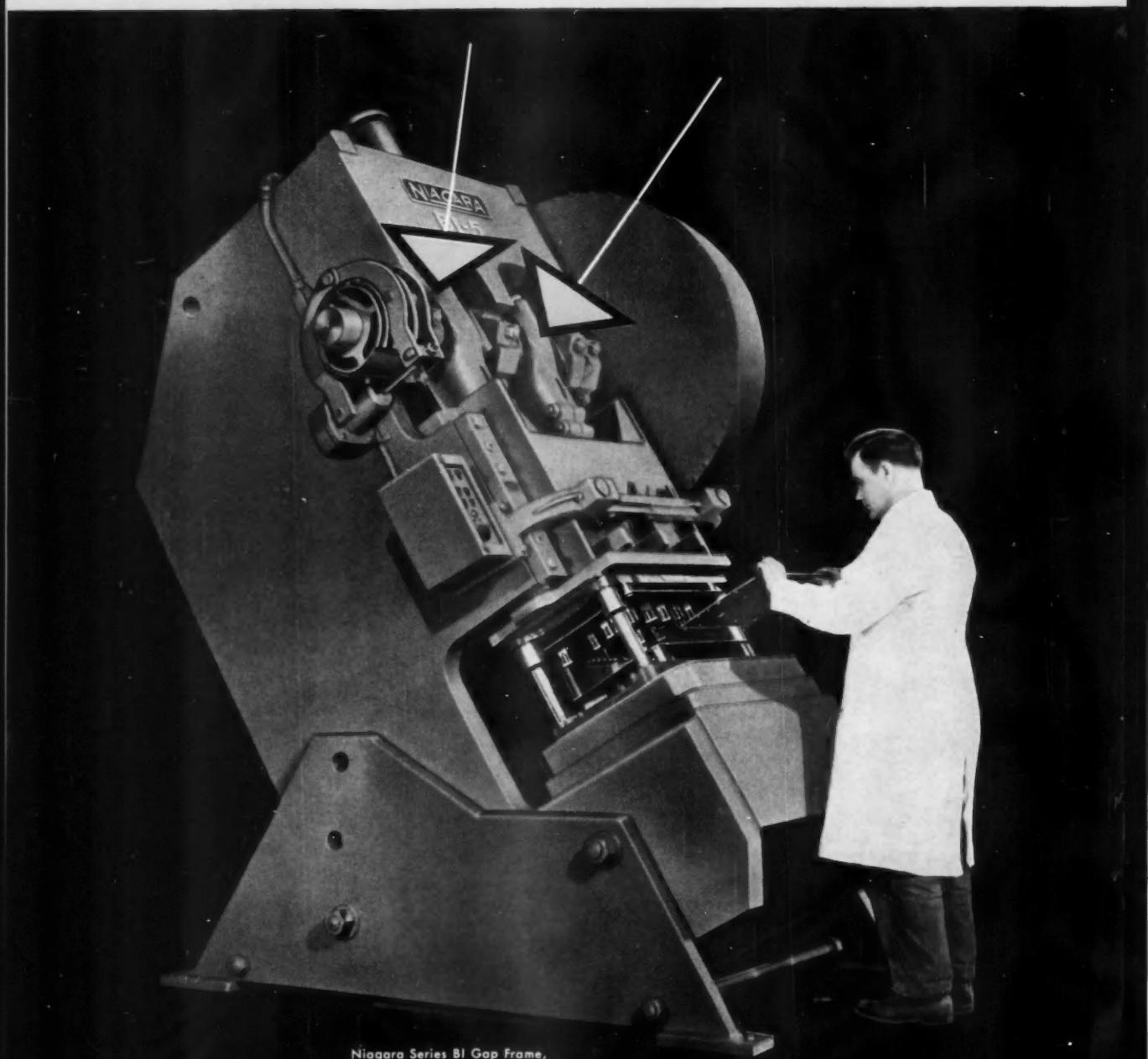
Finer steering linkage and suspension parts, new and advanced manufacturing techniques, better customer service—these are but some of the advantages Thompson will offer when its new Detroit plant begins operations.

Have *your* engineers call on Thompson to help develop your steering linkage and suspension. Write, wire or phone Thompson Products, Michigan Division, 7881 Conant Ave., Detroit 11, Michigan, WAlnut 1-5010.

You can count on Thompson Products

Michigan Division: Detroit • Fruitport • Portland

NIAGARA 2 POINT tomorrow's



Niagara Series BI Gap Frame,
Double Crank Inclinable Press.

INCLINABLES

design for today's production needs*

From crown to base . . . *taking in every part and operating feature* . . . the Niagara Double Crank Inclinable Press Series stands alone in advanced engineering. By record and by reputation, this is the press with the best future for cost-cutting, production-boosting, *long die area work.*

* **LONGER LIFE FOR LONG DIES**

Niagara's double crank design resists tilting of the slide under off-center loading, thereby reducing misalignment of dies. Rugged, welded steel plate, box type slide rigidly supports punches. Heavy duty, rigid, integrally built frame properly resists deflection, maintaining permanent alignment of bearings and slide.

FASTER WORK HANDLING

Die area is accessible from *all* sides. Work may be fed from either side or front-to-back with equal facility, and is quickly discharged by gravity through the unobstructed opening in the back when the press is inclined . . . *yes, even long work!*

GREATER VERSATILITY

A tremendous variety of blanking, perforating, forming and drawing operations can be performed, with emphasis on work requiring long die areas. All presses in the series are designed to readily accommodate pneumatic die cushions which Niagara furnishes complete with accessories and fittings.

HIGHER PRODUCTION RATE

Optionally equipped with automatic feeds and variable speed drives, Niagara 2-Point Inclinables are well suited to large quantity production and long, continuous runs.

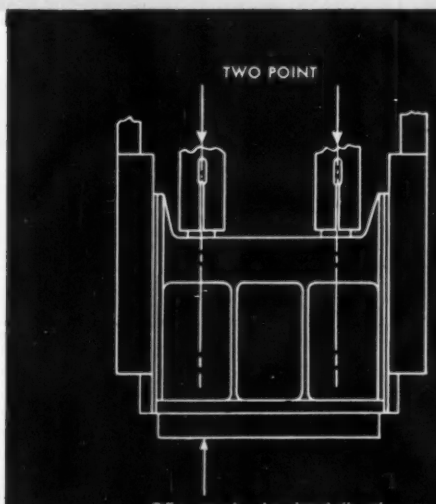
MORE ECONOMICAL MAINTENANCE

Features that spell *stamina* and *ruggedness* . . . welded steel plate frames with box section crowns and deep beds forming rigid ties between uprights; welded steel plate, box type slides; precision "V"-flat gibs; bronze bushed main bearings; self-aligning ball-seat connections; Niagara electro-pneumatic and mechanical sleeve clutches . . . all combine to keep maintenance at a practical minimum.

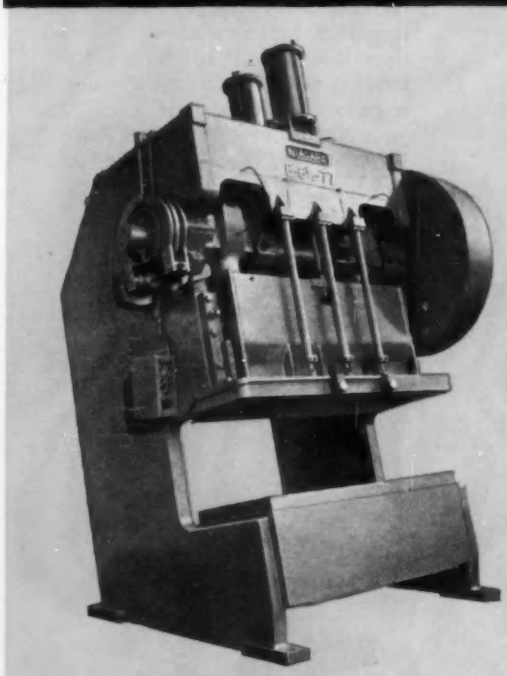
• • •

Standardized in capacities from 60 thru 200 tons, Niagara Series BI Double Crank Inclinable Presses are your most logical answer to long die area work. For still longer requirements, Niagara builds a complete line of permanently inclined or upright Series B Presses.

Obtain complete details on *all* the noteworthy Niagara features by requesting Bulletin 65. Consult with a Niagara engineer about *your* problems.



Off-center load resisted directly by two connections.



Niagara permanently inclined, gap frame, double crank press.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES: Buffalo • Cleveland • Detroit • New York • Philadelphia

Dealers in principal U. S. cities and major foreign countries

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

LINDBERG INDUCTION UNIT IMPROVES HEAT TREATING PROCESSES AT J.I. CASE...

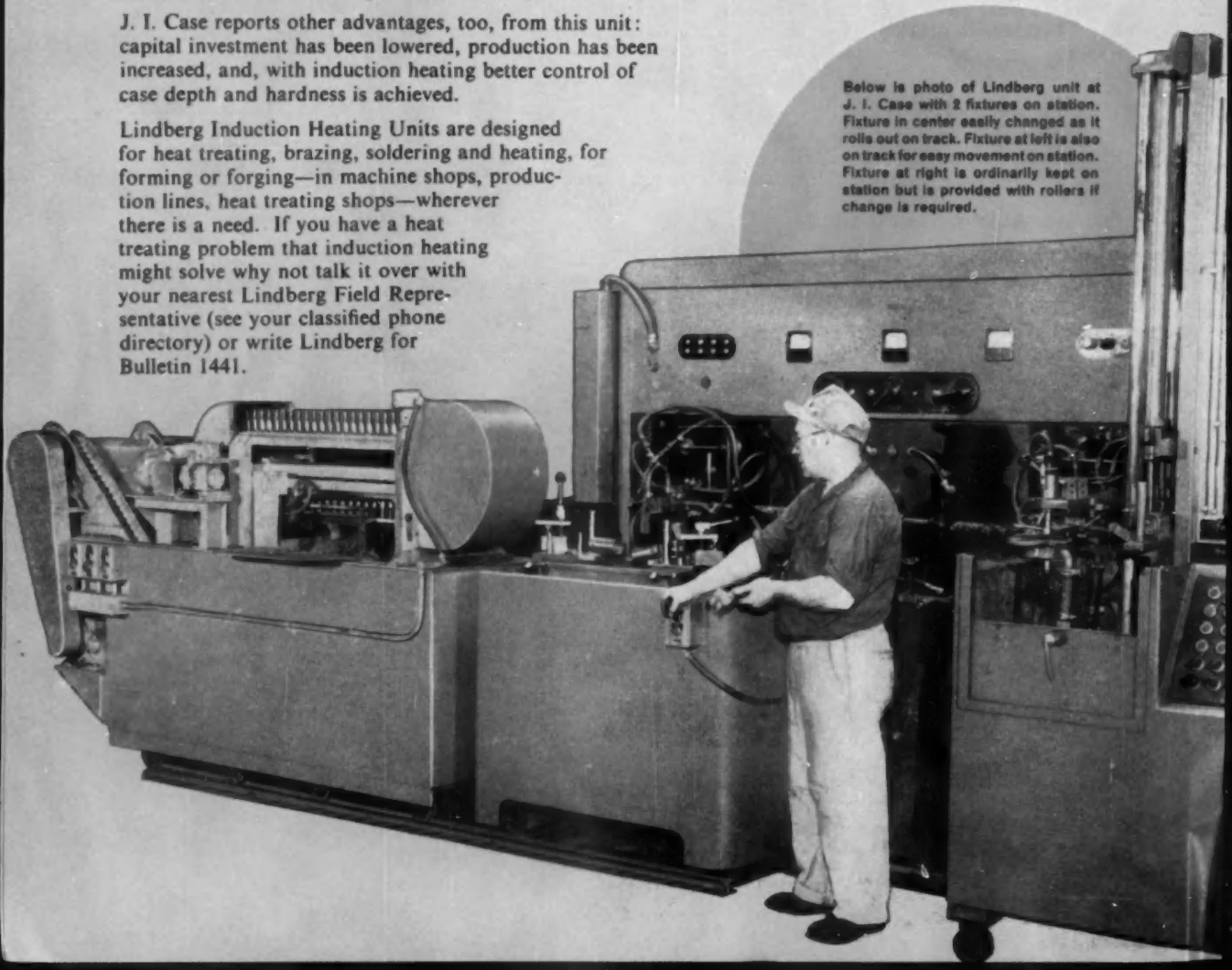
SAVES ½ ITS TOTAL COST— IN 1 YEAR!

A single Lindberg 2-station High Frequency Induction Heating Unit at J. I. Case Co., Racine, Wisc., is providing a happy combination of sizeable cost savings and improved quality and production efficiency in heat treating parts for Case tractors. Actually, the dollar savings effected with this Lindberg unit will repay its total original cost in *less than 2 years!*

This single unit and the five work fixtures provided with it, working on 2 to 3 shifts, 5 days a week to meet production requirements, heat treat some 63 separate tractor parts. Work fixtures are readily changeable, set-up time is materially reduced, and because of the 2-station design, the unit can operate continuously while work fixture is being changed over on one station.

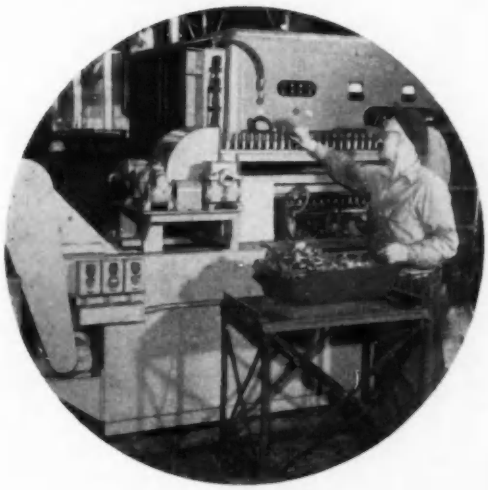
J. I. Case reports other advantages, too, from this unit: capital investment has been lowered, production has been increased, and, with induction heating better control of case depth and hardness is achieved.

Lindberg Induction Heating Units are designed for heat treating, brazing, soldering and heating, for forming or forging—in machine shops, production lines, heat treating shops—wherever there is a need. If you have a heat treating problem that induction heating might solve why not talk it over with your nearest Lindberg Field Representative (see your classified phone directory) or write Lindberg for Bulletin 1441.

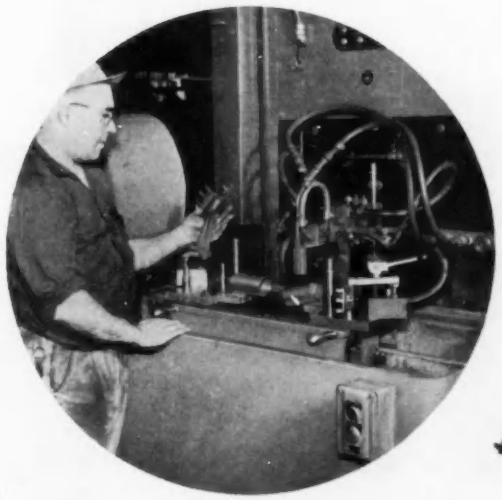


Below is photo of Lindberg unit at J. I. Case with 2 fixtures on station. Fixture in center easily changed as it rolls out on track. Fixture at left is also on track for easy movement on station. Fixture at right is ordinarily kept on station but is provided with rollers if change is required.

(Above) Hydraulic male coupling is being treated on this fixture. 3 other parts are treated by it, too.

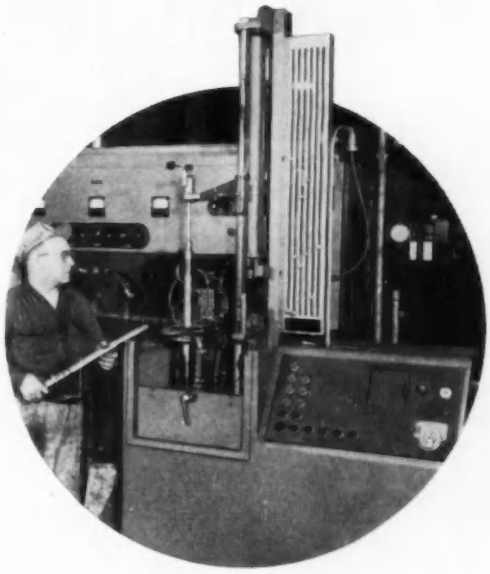


(Above) This shows fixture handling inlet and exhaust valve rocker arms. Same fixture treats 6 other parts.



(Above) This fixture is selectively hardening pads and slots on shifter forks. It is also used for treating 17 other parts.

(Below) This fixture is shown selectively hardening a front axle king pin. It handles piece up to 45½" long, 35" of which can be scanned to desired depth. It is also used for 34 other parts.



(Below) Power take-off hydraulic drive shafts are one of the 3 parts treated by this fixture.

LINDBERG
HIGH FREQUENCY DIVISION
Lindberg Engineering Company
2491 West Hubbard St., Chicago 12, Ill.

more dependable starting *under all operating conditions*

"No Kick-Out" feature sets new standards in starting performance.

● Since the earliest days of the automotive industry Bendix* Starter Drives have been noted for reliable starting.

Now with the new and latest Bendix Folo-Thru Starter Drive, starting, even under the most adverse weather conditions, has been improved immeasurably.

Although this new Bendix Starter Drive is fundamentally similar to its illustrious predecessors, it is specially designed to follow through the weak explosions until the engine actually runs on its own power.

That's why cars, trucks and buses equipped with the Bendix Folo-Thru Drive are easier and quicker to start under all operating conditions.

*REG. U.S. PAT. OFF.

ECLIPSE MACHINE DIVISON OF Bendix AVIATION CORPORATION

ELMIRA, NEW YORK

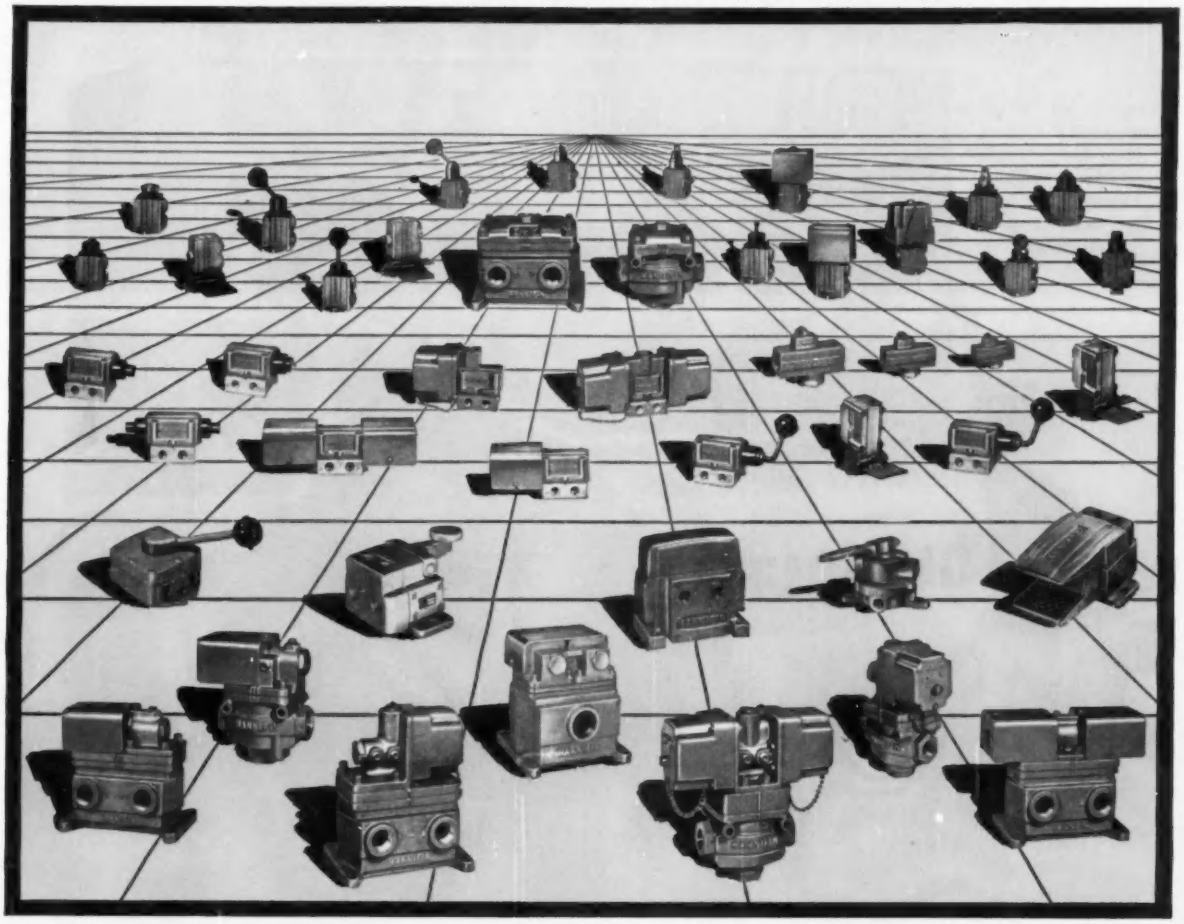
Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

Bendix folo-thru starter drive

costs less —*The new Folo-Thru Drive requires no actuating linkage and the less expensive solenoid may be placed in any convenient position. Results are lower installation costs and no adjustments. Complete detailed information is available on request.*

Bendix* Folo-Thru Starter Drive Bendix* Automotive Electric Fuel Pump Stromberg* Carburetor

FOR AIR CYLINDER CONTROL... Manual or Electric



Hannifin is your best valve source

What air control valves do you need, or prefer? Hannifin has all types—for your production lines or the machines you manufacture. They include:

P-M Pilot-Master Valves, solenoid controlled by integral pilot heads (including new-type, dust-tight, splashproof heads that completely meet J.I.C. recommendations). ⅜" to 1¼". 2-way, 3-way and 4-way.

P-M Master Valves. ¾" to 1¼". 2-way, 3-way and 4-way, air operated. For remote control from a wide choice of P-M Pilot Valves.

P-M Direct-Operated Valves. For direct control of small air cylinders. 2-way, 3-way and 4-way. ¼" and ⅜".

Disc Valves. Rotary and sliding reciprocating disc types for hand, foot or electric operation. ⅛" to ¾".

Micrometric Speed Control Valves for micrometer-like speed adjustment through control of exhaust flow.

You can simplify your air control problems by standardizing on Hannifin.

Stock Delivery On All Types

HANNIFIN

MAIL THE COUPON FOR PROMPT ACTION

- ☐ Have Field Engineer call at once
- ☐ Have Field Engineer stop by soon
- ☐ For the present, just send complete Hannifin Control Valves Catalog

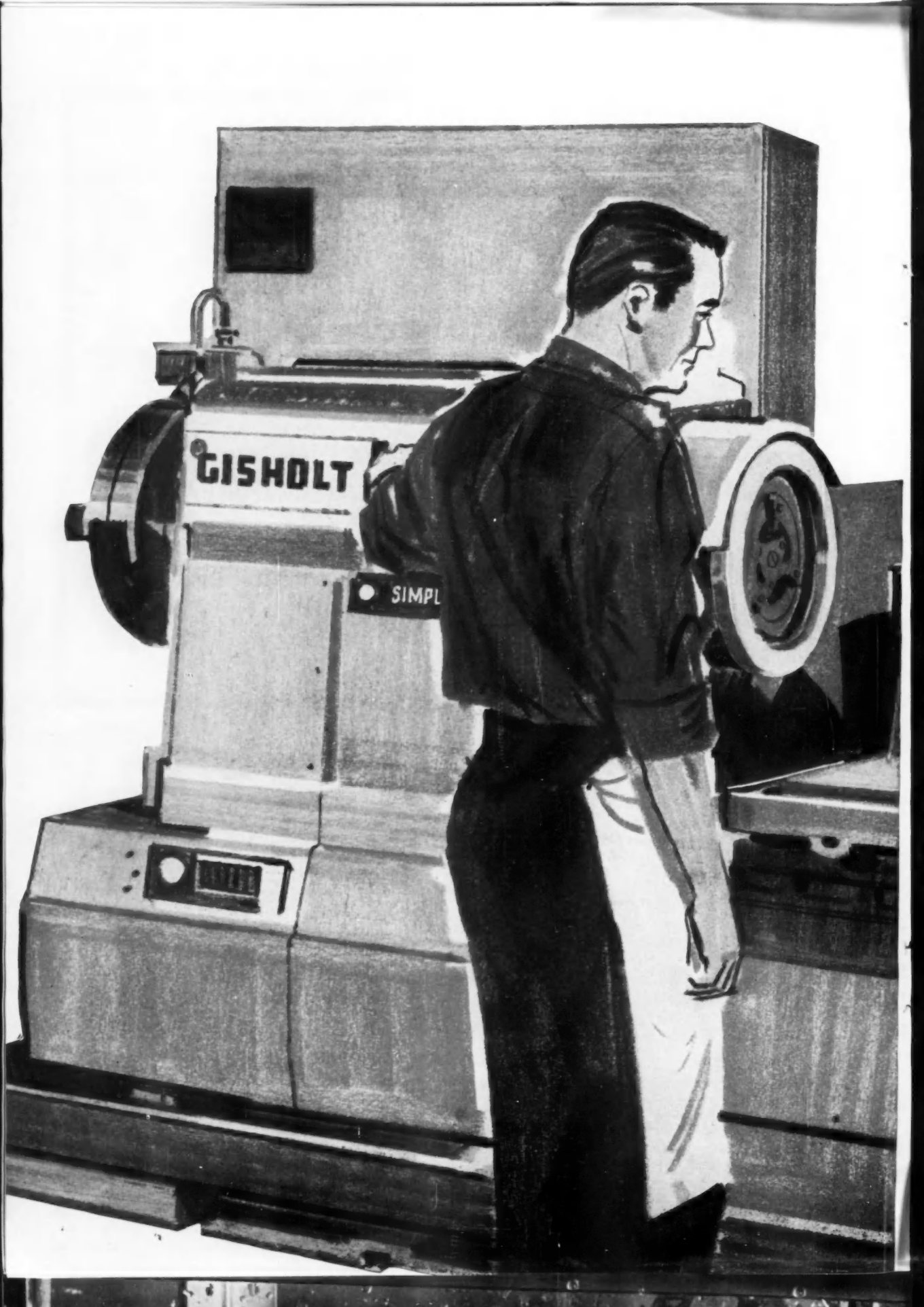
Hannifin Corporation, 543 S. Wolf Rd., Des Plaines, Illinois

Name.....*Title*.....

Company.....

Address.....

City.....*Zone*.....*State*.....

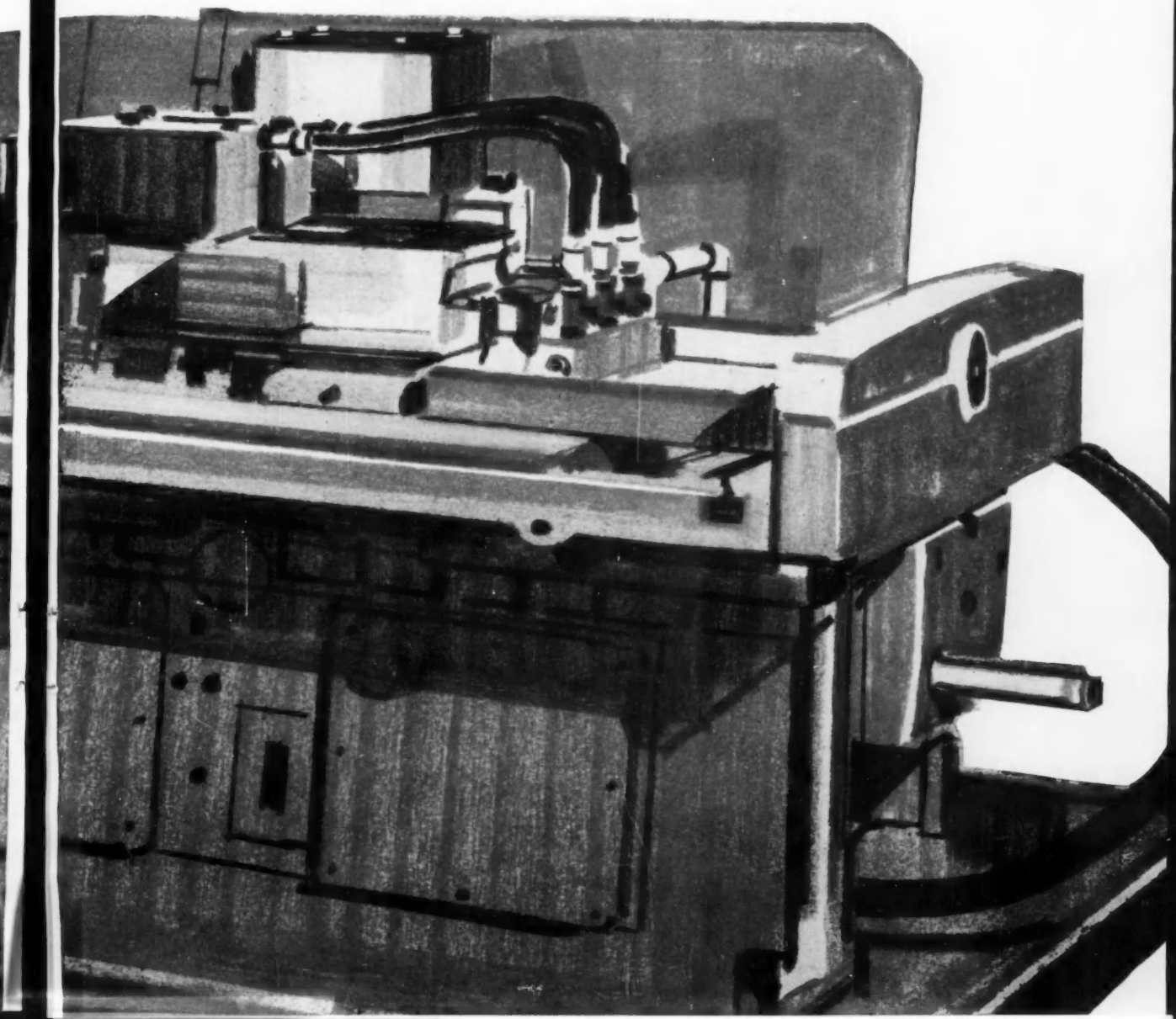

GISHOLT
SIMPL

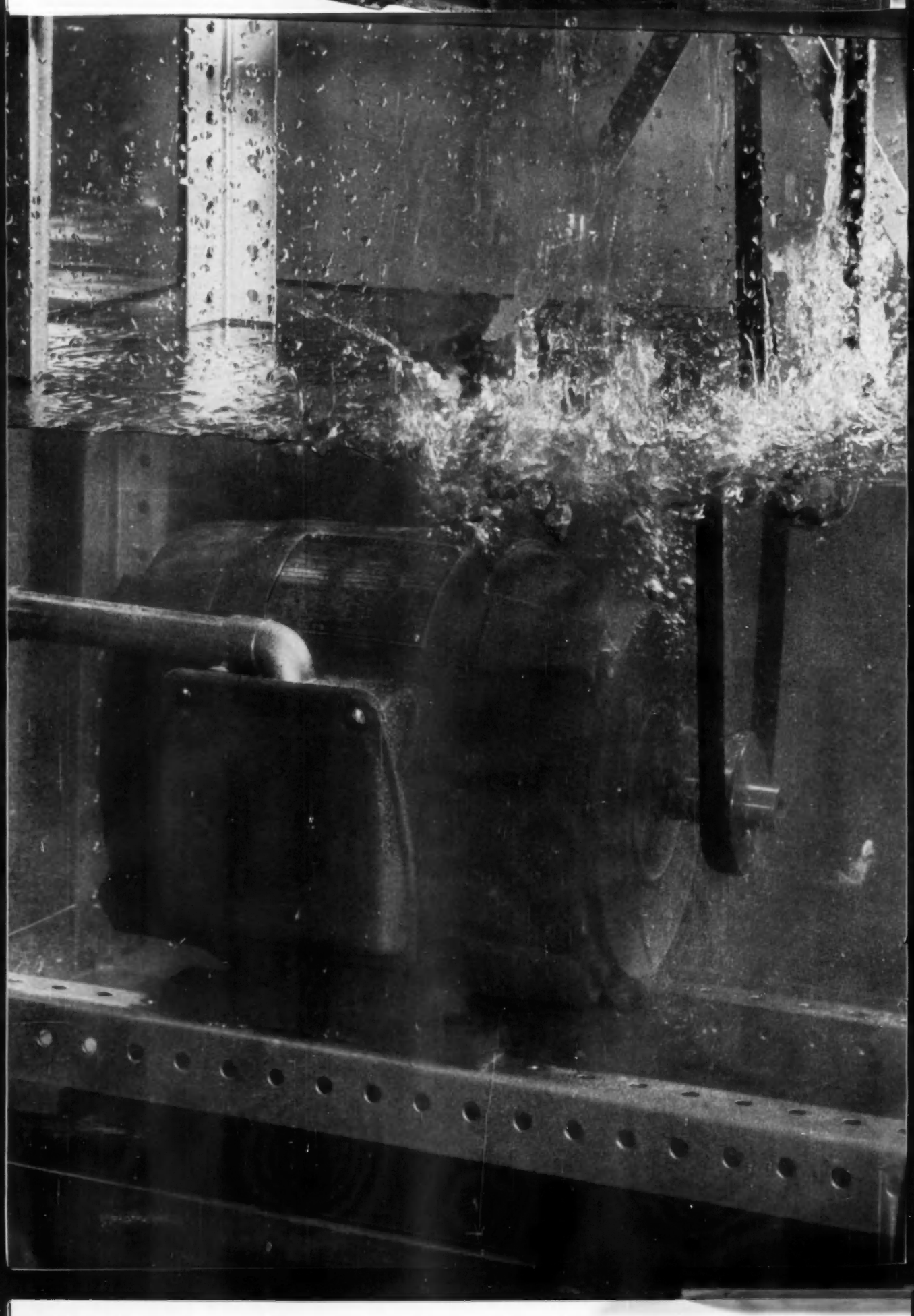
GISHOLT MASTERLINE SIMPLIMATIC AUTOMATIC LATHE

MASTERLINE GISHOLT SINCE 1887

This is the latest design of the Gisholt MASTERLINE Simplimatic. There are many important improvements and outstanding features. Operation is faster. Setup and change-over are quicker. Maintenance is lower. In short, here is an advanced design for better work at lower cost—and with new minimum requirements for operator skill, attention and effort. Let us tell you more about these improved machines—and how they may be applied profitably to your manufacturing processes.

Gisholt Machine Company, Madison 10, Wisconsin
Look ahead—keep ahead—with Gisholt





TOMORROW:

A Standard Motor That Can Live With Water

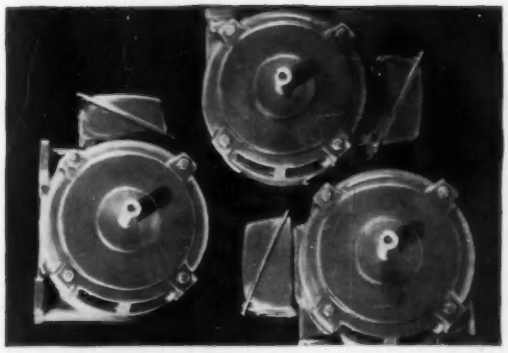
The New Life-Line A Is Another Step Closer

Today's standard motors cannot long endure the water conditions shown here. But Westinghouse is working toward a standard motor that can "live" with water like this tomorrow.

Meanwhile improved frame design, insulation and bearing protection give the Life-Line® "A" more protection than ever before. It can withstand more water and other contamination than any other motor you can buy. It's industry's closest approach to a standard motor that can operate with or within water—in any amount.

Your Westinghouse sales engineer can show you many additional reasons why the Life-Line "A" is industry's most advanced and preferred motor. Call him today.

J-21924



New cast-iron frames and brackets utilize the finest grained castings with uniformly thick-walled sections precisely fitted and sealed—another reason why the Life-Line "A" is so preferred.

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING **TODAY!***

Two outer seals of new 4-way sealed bearing act as flingers and literally throw off damaging contaminations. Inner seals, attached to outer bearing race, are stationary and form a positive labyrinth.

Colson cures

barrel-truck fatigue with

STRONGER BACKBONE FROM OSTUCO

First experimental models of Colson Corporation's barrel and drum handling truck strained, twisted and snapped under loads below their intended 1,000 pound capacity. Failures increased when the Elyria, Ohio, manufacturer tested trucks with heavy loads over rough surfaces.

Tracing trouble to the "Backbone" (the truck's main structural member), Colson and OSTUCO engineers got together, came up with a 1½" square formed seamless tube to solve the fatigue problem. Since 1947, the redesigned drum handling truck has been serving Colson customers, handling loads up to . . . and above . . . its capacity. Successful? Colson has yet to hear of one failure.

Take your cue from Colson. Quality, cost and production problems work themselves out when you talk them over with an OSTUCO engineer. It's easy to start the process by contacting a nearby OSTUCO sales office, or by writing direct to the Shelby factory.

Unique Single-Source Service at OSTUCO eliminates interplant shipment and error . . . another reason why your product can be improved when components are made from

OSTUCO TUBING

SEAMLESS AND ELECTRIC WELDED STEEL TUBING
—Fabricating and Forging

OHIO SEAMLESS TUBE DIVISION
of Copperweld Steel Company • ***SHELBY, OHIO***
Birthplace of the Seamless Steel Tube Industry in America

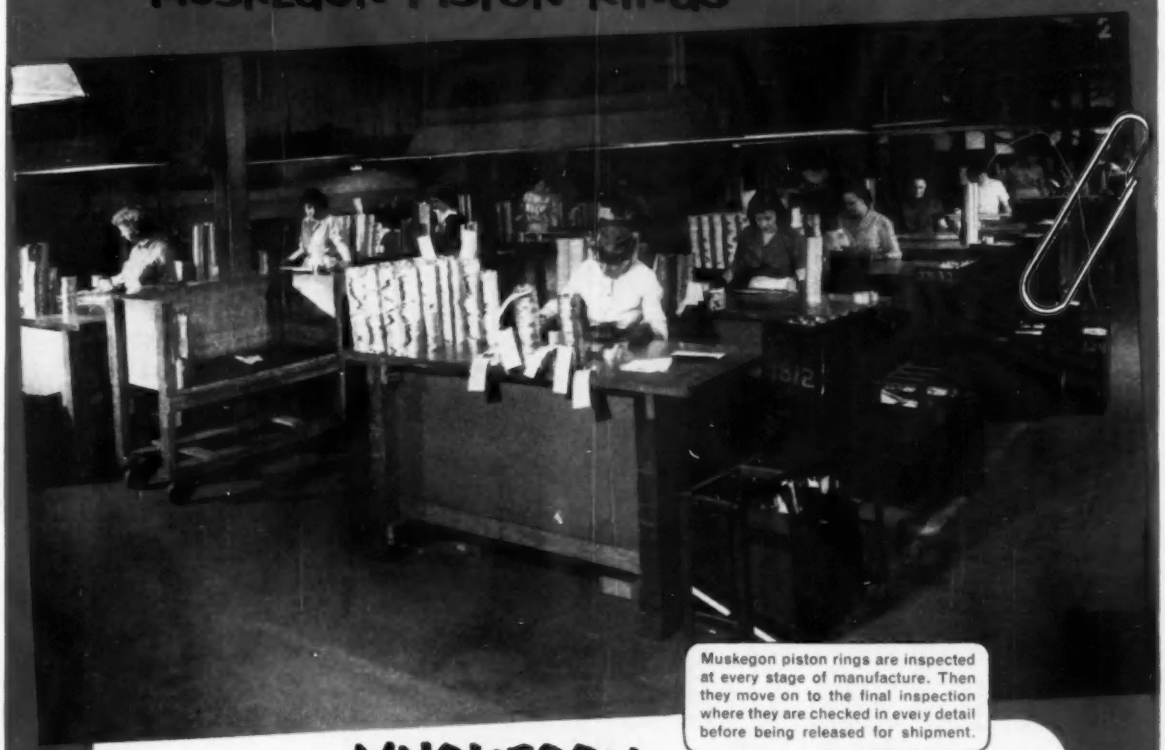
SALES OFFICES: BIRMINGHAM • CHARLOTTE • CHICAGO (Oak Park) CLEVELAND • DAYTON • DENVER • DETROIT (Ferndale) HOUSTON • LOS ANGELES (Beverly Hills) • MOLINE NEW YORK • NORTH KANSAS CITY • PHILADELPHIA PITTSBURGH • RICHMOND • ROCHESTER • ST. LOUIS ST. PAUL • SALT LAKE CITY • SEATTLE • TULSA • WICHITA

CANADA, RAILWAY & POWER ENGR. CORP., LTD.

EXPORT: COPPERWELD STEEL INTERNATIONAL COMPANY
225 Broadway, New York 7, New York

YEAR AFTER YEAR... MODEL AFTER MODEL...

MORE THAN ONE OUT OF THREE CARS ARE EQUIPPED WITH MUSKEGON PISTON RINGS



Muskegon piston rings are inspected at every stage of manufacture. Then they move on to the final inspection where they are checked in every detail before being released for shipment.

BECAUSE MUSKEGON HAS WHAT IT TAKES TO CHECK AND DOUBLE CHECK QUALITY

Ring tolerances are exacting – there can be no allowance for variation from specifications. This means extremely accurate casting, precision grinding, machining and finishing. Muskegon checks and re-checks rings at each stage of manufacture, providing absolute insurance that quality is never sacrificed for quantity.

The quality control system is demanding, but it pays-off in the long run. Year after year, more than one out of three cars are equipped with Muskegon Piston Rings. Without an excellent reputation for ring accuracy and quality, the great demand for Muskegon-manufactured rings would not be possible. Why not see for yourself how Muskegon can provide the most accurate rings you can specify, in the quantities you need?

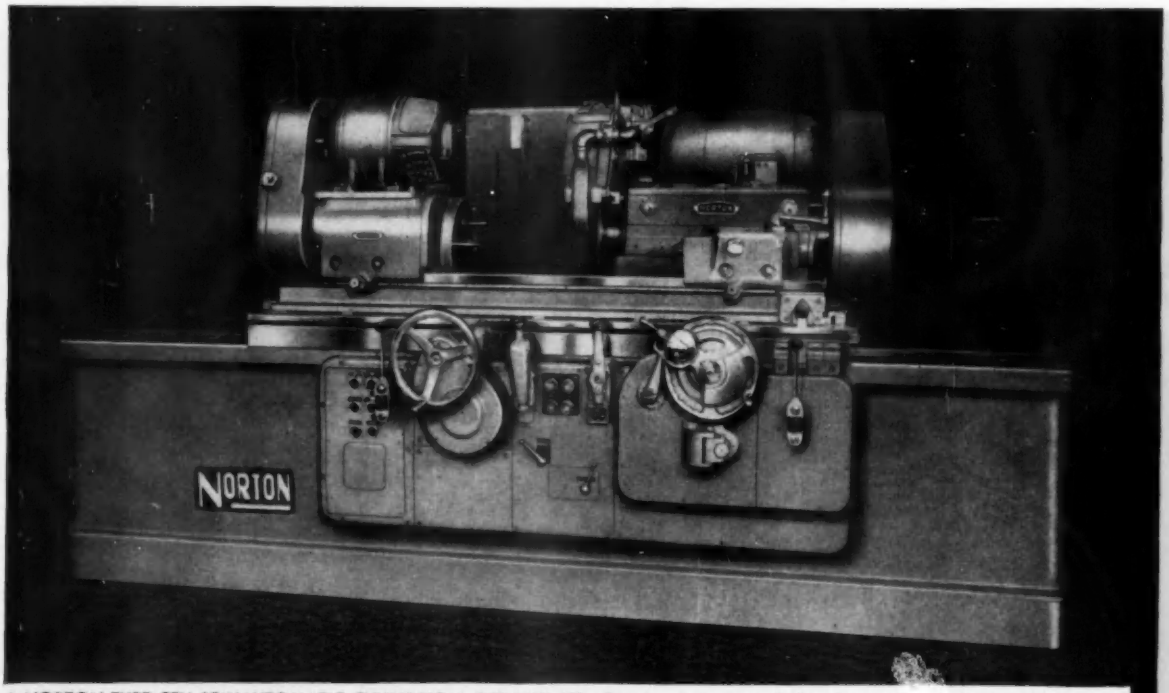
No matter what the design of the individual rings needed to fill the grooves of your piston, rely on Muskegon as your source.

MUSKEGON Piston Rings

MUSKEGON PISTON RING CO.
MUSKEGON, MICHIGAN
PLANTS AT MUSKEGON AND SPARTA

DETROIT OFFICE:
521 New Center Building
Telephone: Trinity 2-2113

Since 1921... The engine builders' source!



A NORTON TYPE CTU SEMIAUTOMATIC CYLINDRICAL GRINDER. The fastest, most economical and versatile grinding machine of its type. One-lever control of the automatic grinding cycle reduces the operator's duties to loading and unloading. Both the 6″ and 10″ Type CTU's are available as semiautomatics or as plain machines.

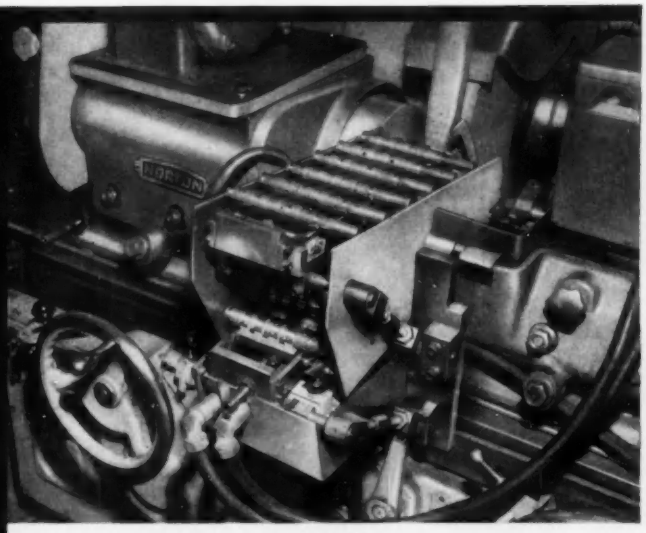
Norton Type CTU Cylindrical Grinders are packed with features for...

Production line and job shop users report that Norton 6″ and 10″ Type CTU cylindrical grinders have doubled and tripled production, replaced several machines and eliminated costly extra operations.

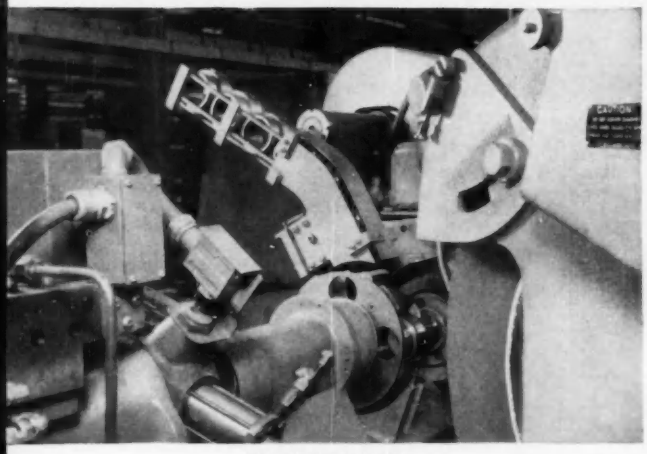
That's because of the many time-and-work-saving "Touch of Gold" features — standard and auxiliary — available with these grinders.

Some of the expertly automated auxiliary features are described here. Check them carefully — and figure their value to your own cylindrical grinding operations. And remember: only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. For further facts, see your Norton Representative, or write to NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

THE SWIVALIGN* ELIMINATES CUT-AND-TRY. Another Norton "Touch of Gold" development for faster, better, lower cost grinding. The SWIVALIGN Dual Electric Indicator, available for Norton cylindrical and universal grinders, enables operators to adjust the angular positions of swivel tables quickly and accurately, eliminating the usual cut-and-try guesswork. Featuring positive response and easy operation, this accurate instrument saves grinding time and money.

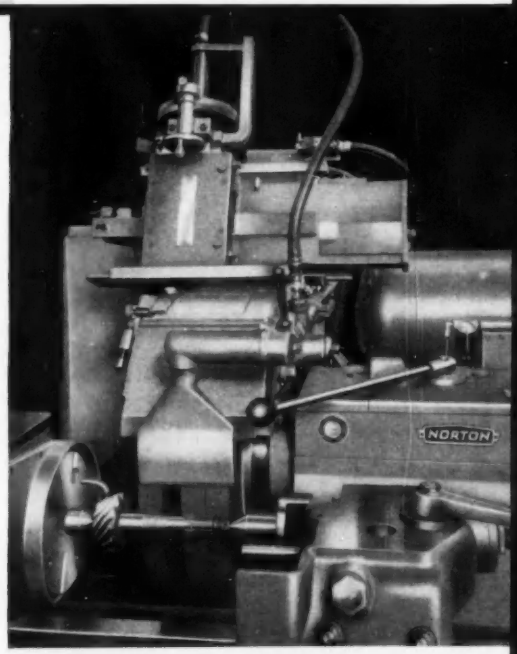


RAIL TYPE



TURRET TYPE

YOUR CHOICE OF AUTOMATIC LOADING DEVICES. Two types of Norton automatic loading devices are obtainable with 6″ and 10″ Type CTU semiautomatic grinders. The rail type loader is designed to handle a variety of small shafts. The turret type loader handles workpieces which must be chucked. Thanks to their steadily paced, automatic operation these Norton-developed loading mechanisms can be adapted to full automation. Or, they make it possible for one operator to tend a battery of machines, speeding production and cutting unit costs day after day.



WHEEL HEAD MOUNTED AUTOMATIC TRUING OFFERS BIG ADVANTAGES. A Norton automatic truing device, as shown here on a Type CTU grinder, quickly repays its original cost. It speeds up production, increases wheel life and increases diamond life. Also, it decreases the skill and effort required with hand truing. Operation is extremely simple. Once the original settings are made, all you do is push a button. Then the diamond automatically makes its round trip across the wheel face, at pre-determined speed and feed. Easy adjustments assure correct settings for each job . . . Another step forward in automatic grinding!

NORTON

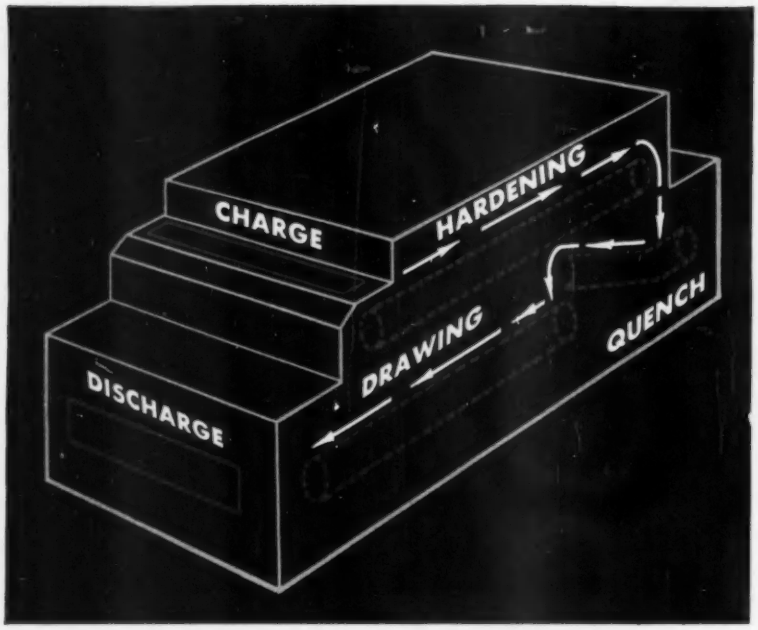
GRINDERS and LAPPERS

Making better products . . . to make your products better

District Offices: Worcester • Hartford • New York Area, Teterboro, New Jersey • Cleveland • Chicago • Detroit

*SWIVALIGN — Norton trade name for Dual Electric Indicator for accurate measurements of swivel table adjustment.

BLAZING THE HEAT TREAT TRAIL WITH HOLCROFT



LET'S TALK ABOUT
DOUBLE DECK FURNACES

Ever try to fit two entirely different furnaces into floor space where only one will go? It can be done. All you do is *stack one on top of the other!*

Holcroft did it first a good many years ago. The furnace illustrated—by no means the first of its type—was built for a Detroit automobile plant back in 1932.

Three thousand pounds of connecting rods and spindles each hour were treated—moving first through a hardening furnace on the upper deck and then down a chute into a quench tank. Work was elevated by means of a reverse conveyor from the tank and loaded onto the return conveyor belt of the lower furnace for drawing and discharge.

Furnaces like these can be fully automated, or have manual transfers. They can be designed to heat treat a specific part, or to be used for general production.

This is the kind of heat treat background and creative engineering that is available to you when you come to Holcroft. It's a good idea to do it—*today!*

HOLCROFT AND COMPANY

6545 EPWORTH BOULEVARD • DETROIT 10, MICHIGAN
PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

CHICAGO, ILL. • CLEVELAND, OHIO • DARIEN, CONN. • HOUSTON, TEXAS • LOS ANGELES, CALIF. • PHILADELPHIA, PA.
CANADA: Walker Metal Products, Ltd., Windsor, Ontario

CALENDAR

OF COMING SHOWS AND MEETINGS

ASME Semi-Annual Meeting, Hotel Statler, Cleveland, O. ....June 17-21

ASTM Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. .....June 17-22

International Machine Tool Exhibition, London, England..June 22-July 6

Drop Forging Association, annual meeting, The Homestead, Hot Springs, Va. .....June 24-27

Machine Tool Builders' Sales Conference, Purdue Univ., Lafayette, Ind. .....July 30-Aug. 3

Air Force Association, national convention and airpower panorama, New Orleans, La. .....Aug. 1-5

SAE National West Coast Meeting, Mark Hopkins Hotel, San Francisco, Calif. .....Aug. 6-8

National Screw Machine Products Association, national sales conference, Wade Park Manor Hotel, Cleveland, O. .....Aug. 7-8

Western Electronic Show and Convention, Los Angeles, Calif. Aug. 21-24

International Ignition Conference, sponsored by Scintilla Div. of Bendix Aviation Corp., Sidney, N. Y. .....Aug. 22-24

American Association of Motor Vehicle Administrators, annual conference, Royal Alexandra Hotel, Winnipeg, Manitoba, Canada .....Aug. 28-31

National Aircraft Show, Oklahoma City, Okla. .....Sept. 1-3

ASME Fall Meeting, Cosmopolitan Hotel, Denver, Colo. .....Sept. 10-12

SAE National Tractor Meeting and Production Forum, Hotel Schroeder, Milwaukee, Wis. Sept. 10-13

National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J. .....Sept. 12-14

Instrument - Automation Conference and Exhibit, Coliseum, New Rork, N. Y. .....Sept. 17-21

International Commercial Motor Transport Show, Earls Court, London, England .....Sept. 21-29

ASME Petroleum-Mechanical Engineering Conference, Conrad Hilton Hotel, Dallas Tex...Sept. 23-26

Trade Fair of the Atomic Industry, Navy Pier, Chicago, Ill.....Sept. 24-28

Atomic Industrial Conference Forum, Morrison Hotel, Chicago, Ill. .....Sept. 25-27

National Electronics Conference, Hotel Sherman, Chicago, Ill..Oct 1-3

SAE National Aeronautic Meeting, Production Forum, and Engineering Display, Hotel Statler, Los Angeles, Calif.....Oct. 2-6

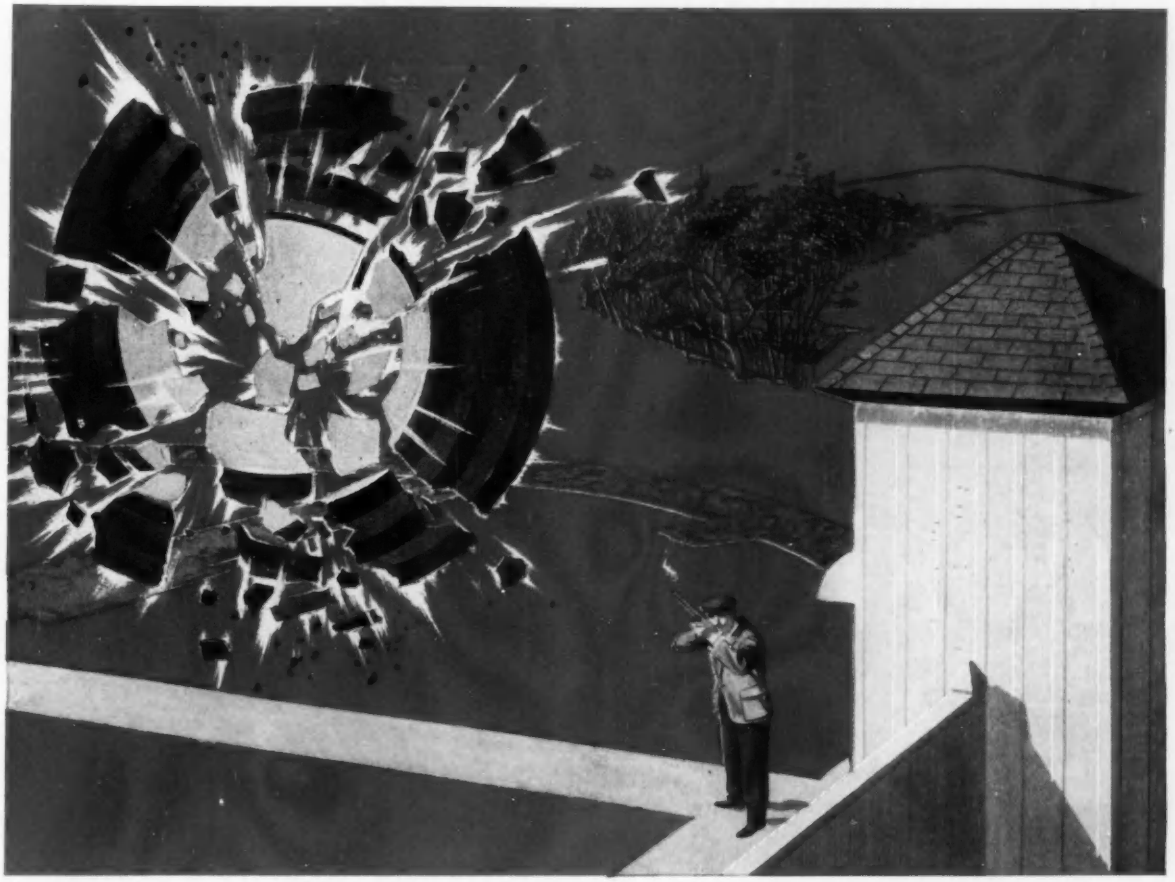
Paris Automobile Show, France..Oct. 4-14

ASME - ASLE Third Lubrication Conference, Chalfonte-Haddon Hall, Atlantic City, N. J....Oct. 8-10

National Metal Exposition, Public Auditorium, Cleveland, O. Oct. 8-12

SAE National Transportation Meeting, Hotel New Yorker, New York, N. Y. .....Oct. 10-12

American Society of Body Engineers, annual convention, Rackham Bldg., Detroit, Mich...Oct. 17-19



"Finish first in your league"
...with J&L 1200 COLD FINISHED STEELS

When your machining applications require a steel that's tops in quality, machinability, uniformity and surface finish—"J&L 1200" Cold Finished Steel is the answer. It's one of a complete line of premium quality, free-machining bar steels developed over the years by J&L specialists. Thus, we can recommend the right type to help solve your problems.

Operators in shop after shop around the country using "J&L 1200" report:

- **Better machine finishes**
- **Improved tool life**
- **Increased machining speeds**
- **Greater uniformity**

"J&L 1200" grades, available in all standard shapes and sizes, meet the compositions published by the American Iron & Steel Institute (AISI C-1213) . . . Society of Automotive Engineers (SAE 1113) . . . and Federal Specification QQS-633.

Use this steel in your own shop to secure better work at lower over-all costs. Results will convince you "J&L 1200" deserves to be a regular specification for your production runs.

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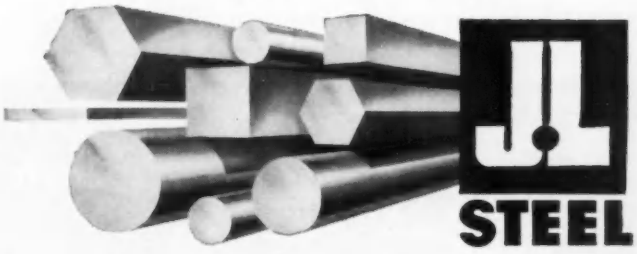

Jones & Laughlin
STEEL CORPORATION · PITTSBURGH

COLD FINISHING PLANTS AT PITTSBURGH, PA., AND HAMMOND, IND.

Planning for tomorrow • Producing for today!

For a third of a century Bendix Products Division has demonstrated time after time its ability to not only meet current production demands, but to actually anticipate future automotive requirements.

For example, Bendix* Power Braking and Power Steering are today two of the industry's most popular new car features because Bendix started planning them years ago.

Likewise, new products now being developed at Bendix Products Division may well be expected to make automotive headlines on future new car models.

That this Bendix program of constant progress will continue is a certainty because looking ahead plays such a very important part of the job at Bendix.

*REG. U. S. PAT. OFF.

BENDIX PRODUCTS DIVISION **SOUTH BEND** INDIANA

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TYPICAL EXAMPLES

Bendix Power Brakes

Bendix Power Steering

Bendix Products Division

Bendix
AVIATION CORPORATION

BRAKES • POWER STEERING • POWER BRAKING • CONSTANT VELOCITY UNIVERSAL JOINTS • HYDRAULIC REMOTE CONTROLS

AUTOMOTIVE INDUSTRIES

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Philadelphia 39, Pa., U.S.A.

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High Spots of This Issue

★ Heat Treating Alloy Steels for Heavy-Duty Axle Service

Current production at Eaton Manufacturing Co. includes many types and sizes of axles. Described here are the heat-treating techniques on their alloy steels that give them the durability required. See Page 50.

★ Fantastic Five Hundred Indianapolis Race

Stirring competition amid spins and wrecks thrilled the spectators at the Indianapolis classic on Memorial Day. AI reporter R. T. Jackson presents an eye-witness account of the race along with a technical analysis. Page 52.

★ Many New Uses for Plastics in Passenger Cars

Steadily growing in favor as a material for various uses in cars, plastics hold great promise for expanded future applications. This study pinpoints present uses and discusses those which may be expected. See Page 58.

★ A New Concept of Diesel Combustion

Much food for thought is provided in this absorbing article that questions the accepted theory of Diesel combustion. The author drives home his telling points with applicable examples and illustrations. See Page 66.

★ Diversified Activities at Temco Aircraft Corp.

Occupying a somewhat unique position in the aircraft industry, Temco Aircraft carries on a variety of work at its three Texas plants. Spotlighted here are some of the tasks it performs and production facilities. Page 68.

★ 36 New Product Items And Other High Spots, Such As:

The year isn't over; improved suspension for British Fords; gasoline-engine starter for Diesels; Chrysler use of aluminum in cars; new Lloyd engine; simplified differential; Russian tractors; and wire programming machine.

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Automotive and Aviation News, Page 33

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS · TRUCKS · BUSES · AIRCRAFT · TRACTORS · ENGINES
· BODIES · TRAILERS · ROAD MACHINERY · FARM MACHINERY ·
PARTS AND COMPONENTS · ACCESSORIES · PROPULSION EQUIPMENT
SERVICE EQUIPMENT · MAINTENANCE EQUIPMENT
· ENGINEERING · PRODUCTION · MANAGEMENT

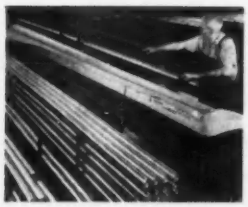
REMINDER LIST
of maintenance steel products

You can save time and trouble in the weeks ahead if you will take a minute now to review your coming requirements for maintenance steel products—those you will want for summer shut-down work as well as your more immediate needs.

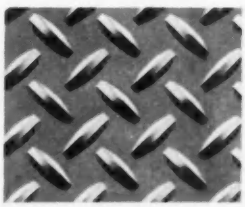
All the products listed below are in good supply at Ryerson right now, and, of course, we have many other maintenance products ready for quick shipment as well—boiler tubes, chain and accessories, tool steel, etc.

When you combine all maintenance steel requirements on one order you may save more than purchasing time. Freight costs may be lower, and prices, too, under the Ryerson quantity differential plan.

Perhaps this list will suggest ways to plan ahead and save

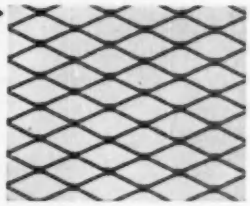


COLD FINISHED SHAFTING—Ryerson stocks of turned, ground and polished bars (C-1025, C-1045 and C-1141) provide a ready source for shafting of outstanding size accuracy, straightness and concentricity. For greater strength draw on Ryerson stocks of heat treated Rycrome—a medium carbon alloy.

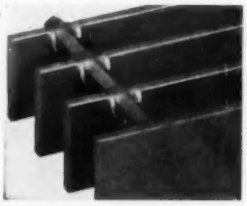


SAFETY PLATE—Tough, rolled steel plate with the Inland 4-WAY safety pattern is available in two pattern sizes for industrial flooring, stairs, ramps, platforms, etc. Firesafe, long wearing, easy to clean, it provides good traction for feet or wheels and presents an attractive appearance. Easy to fabricate and install.

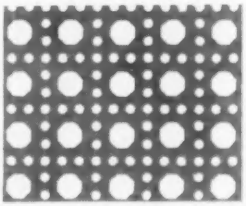
EXPANDED METAL—Furnished in two basic types, standard and flattened, Ryex expanded metal is light yet strong and rigid—easy to handle because all sharp edges have been removed. Use it for room enclosures, machine guards, grilles, shelves, bins, etc. Also available: Ryex expanded metal grating.



WELDED GRATING for strong, rigid and durable open steel flooring is available from Ryerson in stock size panels and sizes tailor-made for your job with all necessary cut-outs and banding. Easily installed and maintained, Ryerson welded grating can be furnished painted or galvanized. Send for engineering data.



STAINLESS PIPE & TUBING and fittings as well, are on hand in a complete range of types—304, 316 and 304-L for welding applications involving severe corrosion, and in a comprehensive range of sizes including schedules 5, 10, 40 and 80 pipe sizes. Valves and welding and screwed type fittings also available.



PERFORATED SHEETS are on hand for immediate shipment in standard cane and machine guard patterns. And you can also get quick service on a wide variety of other patterns perforated to order from large Ryerson stocks of carbon steel and stainless sheets and plates. Send for descriptive literature.

GALVANIZED SHEETS—Tight-coated galvanized that forms without flaking is available in a wide range of gauges and sizes. Sheets take paint or lacquer readily without "weathering." And for roofing, siding, etc. they can be furnished with standard corrugation or with the attractive new mansard corrugation.

GLYCO BABBITT METAL AND RYERTEX BEARINGS—Glyco Babbitt, produced in our own foundry from top quality virgin metals, is available in five grades to meet every babbitt bearing requirement. Ryertex plastic bearings which need only water lubrication can also be furnished promptly—in any size or shape.

RYERSON STEEL

In stock: Bars, structurals, plates, sheets, tubing, alloy and stainless steel, re-bars, machinery and tools, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 114, No. 12 June 15, 1956

Plymouth Body-Making Plant To Become Storage Facility

Another oldtime automobile manufacturing plant in Detroit will be inactivated before the end of the year. The plant is the 44-year old Meldrum body-making facility which Chrysler Corp. purchased from Briggs Manufacturing Co. three years ago.

Chrysler is currently shifting production of Plymouth station wagons from the unit to the Mack Ave. facility. It has been modernizing and expanding this plant during the past several years.

Most of the Meldrum plant's recent production has been devoted to station wagon bodies for Plymouth, although in the past it was used to build a wide variety of special passenger car bodies in addition to "wagons." The Mack Ave. plant will now supply all such bodies for the Plymouth plant in Detroit.

At peak schedules, the 500,000 sq ft Meldrum plant produced 400 bodies a day on a two-shift basis. It was constructed in 1912 and purchased by Briggs in 1925. When the last car body comes off the line there in August, the plant probably will be converted into a storage facility.

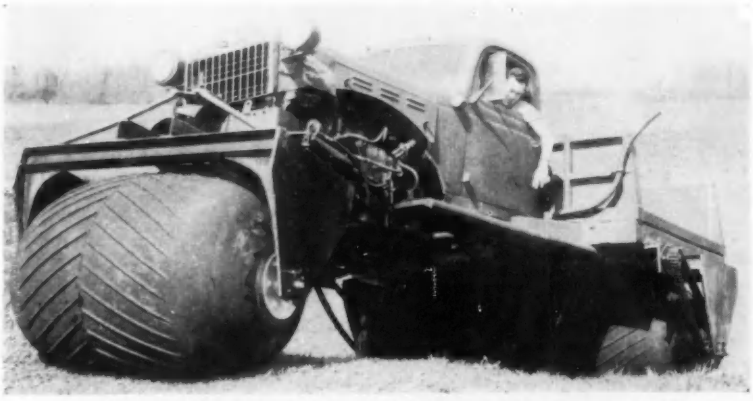
Ford Reaffirms Faith in Future With Continued Expansion Plans

Despite some concern over the decline in car sales this year, automobile companies are proceeding with their expansion plans for this year and for 1957. Reaffirming his optimism expressed earlier this year, Henry Ford II, at the company's first annual stockholders' meeting last month, said Ford is stepping up its capital expenditures program considerably. A total of $592 million is earmarked for new facilities this year.

The above amount is about one-third of the total of $1.67 billion the company spent between 1946 and 1955. An additional $400 million is being earmarked for 1957 to further bolster the company's optimism for the future. Mr. Ford said he expects earnings in the second and third quarter will be substantially under last year as a result of lower car sales and increased capital outlays.

The Ford president estimated that domestic new car sales in 1956 would total slightly under six million, about 600,000 units fewer than he forecast earlier this year. Ford sales during the first four months of this year accounted for 26.6 per cent of the industry market, a decline of only half of one per cent in market penetration under the comparable figure in 1955.

The Ford meeting at Dearborn, Mich., attracted approximately 2700 persons. It is interesting to note that in less than one year Ford has become one of the largest publicly owned companies in the world. As of April 12, the company had 319,000 stockholders on record.



HIGH-FLOTATION TIRES CHALLENGE TOUGH GROUND

Dodge Power Wagon, equipped with barrel-shaped Goodyear Terra-Tires, is shown negotiating an incline during a test run. The soft pneumatics receive their motive power directly from the engine through a hub and axle fitting. They thus can take trucks, trailers, and off-the-highway vehicles over all types of terrain and roadways.

Long Shows Confidence in Parts Field By Progressive Expansion

In the midst of reports that some automotive parts suppliers have been experiencing difficulties, it is encouraging to note that many others are forging ahead with ambitious plans for the future. One such company is the Long Manufacturing Div. of Borg-Warner Corp.

Long has developed a broad program designed to enable it to penetrate further the automotive and farm equipment fields. It has spent about $2 million on a two-part plan which includes modernization of facilities and development of a whole series of new products.

Among a total of 42 new products developed so far are 14 showing considerable promise for the automotive market. Included are improved brakes, retarder for supplemental braking, an all-aluminum radiator, and an economical drive for operating accessories.

News of the AUTOMOTIVE

ENGINES ARE "RUN-IN" ON LINE IN AUSTRALIA

Presented here is a general view of the conveyor and running-in system for engines set up at the Standard Motor Co. of Australia Pty., Ltd. At the near right an engine is being coupled to the oil line for lubrication. Overhead is runway along which drive heads move back to connect up with an engine when it reaches required position on the line. (Photo by Australian News and Information Bureau.)

American Motors Will Sell Stock Still Held in Ranco

American Motors Corp. plans to sell its last remaining interest in Ranco, Inc., a refrigeration and heating controls company it controlled for many years. The company will offer 216,950 shares of common stock through an underwriting group about June 20.

The stock represents 21.7 per cent of Ranco's outstanding one million shares. Last November, AMC sold its controlling interest in the company for $7.14 million, and applied that profit to its October-December quarterly statement to give the company its first net profit.

GM Alters Wholesaling Program For Car and Truck Repair Parts

General Motors has drastically revised the expanded passenger car and truck parts wholesaling program which it inaugurated early in 1954. It has withdrawn most of the GM-manufactured engine and chassis parts which were put into the AC and United Motors Service lines for sale through jobbers to the independent garage trade. Hydra-Matic transmission parts will remain in the UMS line, however, and hydraulic valve lifters will continue to be merchandised through AC jobbers.

Cut-off date for terminating the program was May 28. UMS distributors, however, will have until Dec. 31, 1957 to liquidate their stocks through normal sales channels or to return all unsold merchandise under the obsolescence plan. They will receive reimbursement of cost, plus five per cent for packaging on all merchandise returned to GM. AC is unaffected, since it took on only the valve lifters, which are retained in the line.

New car and truck dealers are not affected by the change in program other than that they now become the wholesale outlet to the independent repair trade on car and truck engine and chassis parts made by GM, a function which they have shared with UMS and AC. They will retain any UMS items they were given under the broadened parts program and which they had not carried prior to the time the plan went into effect.

19 Chrysler Plants Integrated Under New Management Group

In line with its continuing program of integrating certain plants under separate groups, Chrysler Corp. has established a Stamping and General Manufacturing Group. Embracing 19 plants, the new group will consist of two divisions—a Stamping Div. and Parts and Equipment Div.

The Stamping Div. will embody 16 plants—14 in Detroit and two in Ohio. The Parts and Equipment Div. will be comprised of three plants—two in the Detroit area and one in New Castle, Ind.

This marks the third new group to be formed by Chrysler in a little over a year. The other two were the Special Products Group and the Engine and Transmission Group. The new group also further integrates the former Briggs facilities with the corporation system.

Hamilton Standard Speeds Pace In Jet Age By Diversification

Eight years ago, Hamilton Standard Div. of United Aircraft Corp. decided to diversify its production lines, then devoted exclusively to aircraft propellers and propeller accessories. Since that time, it has branched out into the field of equipment for turbojet and turboprop aircraft.

Today, approximately one-third of Hamilton Standard's production space and much of its extensive development and research space are taken up by new jet-age products. They include air conditioning systems, electronic and hydromechanical engine fuel controls, pneumatic and fuel-air engine starters, hydraulic pumps for aircraft hydraulic systems, and a wide variety of pneumatic valves for a multitude of jobs.

Novel Brake Fluid Indicator Considered By Car Producer

One automobile manufacturer is considering an electric brake fluid level indicator as a possible accessory. A red light on the dashboard, actuated by a metal float in the master cylinder, would light up when fluid drops to a dangerous level.

AND AVIATION INDUSTRIES

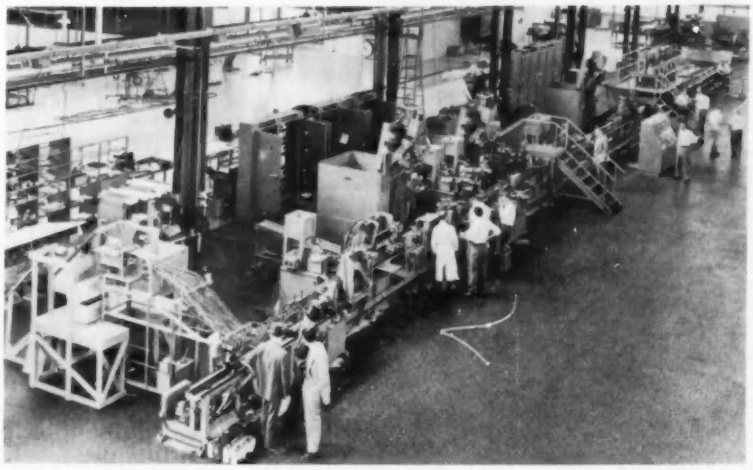
Chevrolet's New Transmission Plant To Contain 728 Machines

Some additional details about Chevrolet's newest automatic transmission plant in Cleveland were given recently by T. H. Keating, general manager of the division, at formal welcoming ceremonies in that city. The facility, formerly operated by Martin-Parry, will contain 728 productive machines when renovation is completed later this year. Nearly 400 of the machines already have been installed.

Because of the deep bed of sand underlying the factory site, 41-ft pilings had to be used to support the heavier machines that are being installed. More than three million wood blocks were used to cover the original cement flooring of the plant.

Chevrolet for the first time will die cast aluminum parts at the new plant. The die casting work will be done in an adjoining smaller unit, which Chevrolet acquired from Brown Trailer and which has been integrated with the Martin-Parry facility.

The Brown unit also will turn out all the transmission sheet metal and forged parts. Among the new machines to be installed will be one containing 37 stations and 201 spindles to deliver a finished transmission case accurately bored, drilled, reamed, and milled from a rough casting. Containing about 1 million sq ft of space, the new facility will employ upwards of 2500 persons when in full operation.



SUPER-SIZE CYLINDER HEAD ASSEMBLY MACHINE

This cylinder head assembly machine, developed at the General Motors Technical Center, will be installed at Oldsmobile Div. Running 137 ft in length, the machine will assemble 75 parts into the completed cylinder head for the Oldsmobile Rocket engine. The head is placed on an indexing transfer line that moves it intermittently from station to station for the assembly of valves, spark plugs, head bolts, etc. The machine also will indicate improperly secured valves to help insure uniform quality.

First Design Engineering Show Viewed as Spectacular Success

The Convention Hall site of the First Design Engineering Show in Philadelphia last month was a veritable beehive of activity. Even the show sponsors themselves were reported surprised at the number of sales attributed directly to the exposition. As a matter of fact, it was estimated by some observers that new orders running into tens of millions of dollars will eventually be booked as a result of the interest shown in the host of new products exhibited.

Guesses on the number of products shown ran upwards of 30,000 units in the form of components, materials, finishes, shapes, fasteners and other elements which go into the making of end products. Items on display ranged from a host of synthetic materials to large mechanical components.

E. I. du Pont de Nemours & Co., Inc. had a huge exhibit of synthetic materials such as Zytel nylon, Teflon, Lucite, Mylar, in addition to molding powders and textile fibers. Cleveland Cap Screw showed a variety of special threaded fasteners and announced what is said to be the world's largest bolt making machine, with a 1¼ in. diam capacity, which will shortly go into production.

L-O-F Glass Fibers Co. featured its Garan glass fiber roving for rod stock, molding compounds, performing, mat, and woven roving. Thermoid Co. showed a new woven, non-metallic, asbestos fabric for transmission equipment in its booth. The material can be used for clutches, torque converters, and brakes.

Corning Glass Works demonstrated its new precision metal-casting technique using one-piece glass powder molds. Known as the Glascast disposable pattern process, it follows the lost wax technique in many respects.

Fromson Orban Co., Inc., showed a product known as Lurium. It is claimed to be the highest purity (99.9 per cent) aluminum available commercially. The same company also had continuously anodized and dyed aluminum strip—called Ano-Coil—in coil stock.

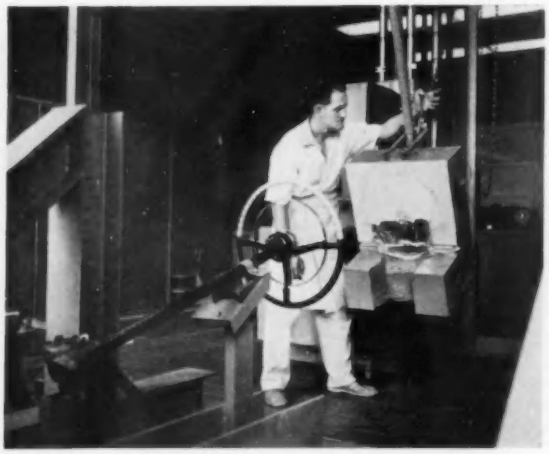
Minnesota Mining & Manufacturing Co. announced new thermosetting, self-curing polyisocyanate foams for insulating and reinforcing voids between structural members. The foams form a rigid lightweight cellular material that will not sag or break loose.

Adjustment in Car Output Could Cut Stocks Markedly

The current record field stock of some 900,000 cars should be pared substantially in the third quarter now that the industry has adjusted production schedules to parallel more closely the lower rate of sales. It is possible that inventories could drop by 400,000 or 500,000 units at the present rate of production to place the industry in a good position for the final quarter of the year.

Although sales have been sluggish since the beginning of April, indications are that 1956 will turn out to be the third best sales year on record.

News of the AUTOMOTIVE



SAFETY FIRST

A safety research technician at Ford Engineering Staff is shown releasing a 160-lb "body block" into a steering wheel in a test which will determine how much energy the wheel can absorb before failure. The test is a part of Ford's program aimed at developing safety devices and engineering designs to minimize injuries caused by traffic accidents.

1956 WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by The Automobile Manufacturers Association

	For Weeks Ending				Jan. 1, through
	June 2	May 26	May 19	May 12	June 2, 1956
PASSENGER CAR PRODUCTION					
Hudson	395	606	502	307	17,234
Nash	971	1,086	1,122	1,149	39,598
Total—American Motors	1,366	1,692	1,624	1,456	56,832
Chrysler and Imperial	1,085	2,665	1,640	2,311	55,608
De Soto	874	1,591	1,541	1,439	49,222
Dodge	3,702	4,484	3,829	4,276	91,680
Plymouth	3,971	8,611	8,536	9,666	215,224
Total—Chrysler Corp.	9,632	17,351	15,546	17,692	411,734
Continental	12	12	21	26	973
Ford	19,920	24,482	25,430	25,190	600,416
Lincoln	326	945	1,042	852	24,164
Mercury	670	8,197	6,455	6,253	118,197
Total—Ford Motor Co.	20,928	31,636	32,948	32,321	743,750
Buick	7,619	9,604	10,211	8,590	288,336
Cadillac	2,660	3,387	3,254	2,814	72,234
Chevrolet	24,807	29,272	26,705	26,991	760,622
Oldsmobile	5,970	7,647	7,823	6,735	222,364
Pontiac	4,409	5,658	6,190	4,943	169,771
Total—General Motors Corp.	45,265	55,568	54,183	52,073	1,511,327
Packard	262	480	479	585	11,592
Studebaker	346	1,397	922	1,225	43,050
Total—Studebaker-Packard Corp.	608	1,877	1,401	1,810	54,642
Checker Cab	34	112	97	80	1,263
Total—Passenger Cars	77,833	108,236	105,799	105,432	2,779,548
TRUCK PRODUCTION					
Available	7	7	8	7	178
Chevrolet	5,649	6,322	5,943	7,042	170,067
G. M. C.	1,597	2,212	1,826	1,524	44,731
Diamond T	78	102	103	109	2,137
Divco	64	80	81	80	1,865
Dodge and Fargo	1,617	1,848	1,863	1,931	38,689
Ford	4,832	5,790	6,067	6,069	136,990
International	2,117	2,739	2,587	2,768	63,544
Mack	328	453	390	355	8,227
Marmon-Herrington	8	3	0	0	174
Reo	62	79	77	78	1,606
Studebaker	96	333	285	360	6,778
White	237	383	386	372	8,339
Willys	581	1,295	1,093	1,253	26,381
Other Trucks	123	128	141	141	3,271
Total—Trucks	17,396	21,774	20,852	22,089	512,979
Buses	74	119	103	88	1,873
Total—Motor Vehicles	95,303	130,129	126,754	127,609	3,294,400

Retired Judge Appointed As Dealer Umpire By GM

The appointment this month of an impartial dealer umpire, who will adjudicate any appeals made by General Motors car dealers from decisions made by the corporation's divisions, ends speculation about who would be named to the important position. Named to the new position, the first such in the automobile industry, is William C. Coleman, a retired chief judge of the U. S. District Court for the District of Maryland.

Coleman's chief function will be to settle any disputes which may arise between GM divisions and the dealers. His appointment marks another step in putting into effect GM's new Quality-Dealer Program, formed last March as part of a broad program designed to strengthen relationships between GM and its dealers. The impartial umpire post supersedes the Dealer Relations Board.

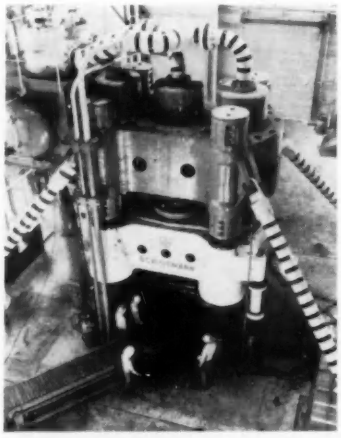
Mogul Seeks To Merge With National Bearing

Shareholders of Federal-Mogul-Bower Bearings, Inc., Detroit, and National Motor Bearing Co., Redwood City, Calif., will vote July 25 on a proposed merger of the two concerns. Acquisition of National Motor Bearing would add an important line of oil seals and other products to Federal-Mogul's service line.

It would be the third firm which Federal-Mogul has either acquired or merged with since December 1953. The other two were Bearings Co. of America and Bower Roller Bearing Co.

Eaton Planning Expansion For Newly Acquired Plant

In anticipation of greater volume, Eaton Manufacturing Co. is planning to expand the Richmond, Ind., plant it acquired last March from Automotive Gear Works, Inc. No specific details were given about the expansion program. The Richmond plant now operates as a subsidiary of Eaton and manufactures gears for farm equipment, automotive, and other industrial uses.



BIG HYDRAULIC PRESS

Now in operation at the Vernon, Calif., works of Aluminum Co. of America is this huge 8000-ton hydraulic press. Producing large and high-strength aluminum forgings, the press stands 33 ft above floor level and weighs 750 tons. Four steel struts at the corners make it earthquake-proof.

Jet Fuels Laboratory Hailed As Texaco Research Keystone

The Texas Co. has announced the opening of a large new jet fuels laboratory at its principal research center in Beacon, N. Y. The $250,000 installation is said to be the first company-financed installation in the petroleum industry capable of testing jet fuels in full-scale combustors.

Test apparatus consists of three air compressors with a total of 1800 hp, a gas-fired air heater, test stands for three full-scale aircraft gas turbine burners, and special exhaust silencers. In addition, there are associated controls and instruments needed to carry out tests and record data.

The actual test area in the new two-story building consists of two test cells. One is for high-pressure testing and has one combustor test stand. The other is for medium pressure and vacuum testing.

The laboratory has been designed with maximum flexibility for evaluating present and future aircraft gas turbine units and also for studying fuels in other gas turbine power systems of various types.

AI TABLOID

Vertol Aircraft Corp. has received an $850,000 military contract for development of a turbine-powered vertical take-off and landing aircraft.

* * *

Corporacion Venezolana De Acumuladores, S. A., is name of new company set up by Electric Auto-Lite Co. and Venezuelan interests in Caracas to manufacture electric storage batteries.

* * *

General Electric Co. has announced a $23 million expansion and modernization program covering the next five years for its Medium Steam Turbine, Generator and Gear Dept. Included are facilities for production of high-speed aircraft gearing.

* * *

Tyer Rubber Co. is celebrating its 100th anniversary this year.

* * *

Firestone Tire and Rubber Co. is making its Super Sports 170 tire available for trade sales.

* * *

Aluminum Co. of America plans to spend about $600 million on expansion and improvement in the next five years.

* * *

Pilot line for the chemical milling of steel and titanium has been established at the Los Angeles plant of Turco Products, Inc., in a joint research and development effort with North American Aviation, Inc.

* * *

Vickers, Ltd., has acquired a controlling interest in Canadian Vickers, Ltd.

* * *

Babcock & Wilcox Co. has begun production at its nuclear facilities plant near Lynchburg, Va.

The nation's steel industry will have to spend $1.1 to $1.5 billion in each of the next five years merely to replace facilities that wear out and become obsolete.

* * *

Boeing Airplane Co. is considering production of a short-range jet transport.

* * *

Douglas Aircraft Co., Inc., has dedicated its new Charlotte, N. C., Ordnance Missile Plant. . . . American Bosch Mississippi Corp. recently dedicated a $1.164 million addition to its Columbus, Miss., plant.

* * *

French concern of Renault is considering the establishment of an automobile manufacturing plant in Brazil.

* * *

Quaker Rubber Div. of H. K. Porter Co., Inc., has developed a new compound to make vacuum bags for the reinforced plastics industry.

* * *

Westinghouse Electric Corp. is supplying the electrical apparatus for the head-end power car of the new stainless steel tubular train being built by the Budd Co. for the Penna. R. R.

* * *

Reynolds Metals Co. has delivered its first commercial order of titanium extrusions to a manufacturer of jet engines.

* * *

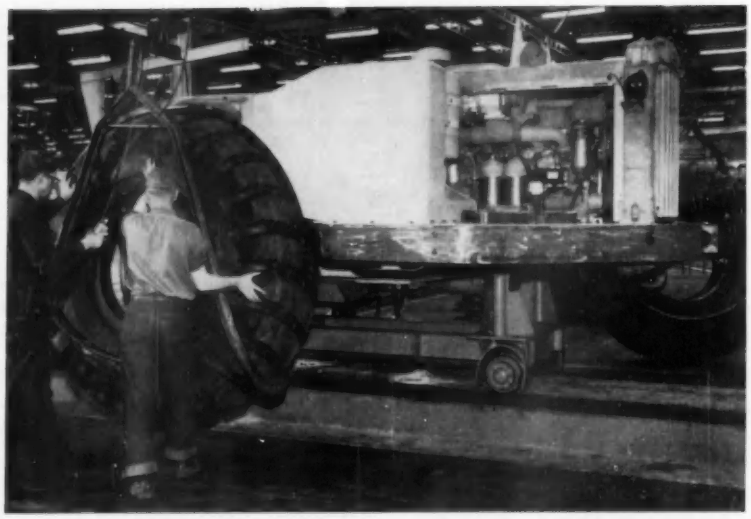
Square D Co. will build an electrical equipment assembly plant in Atlanta, Ga., as the base of expanded operations in the southeast section of the U. S.

* * *

India produced 22,094 cars and trucks in 1955.

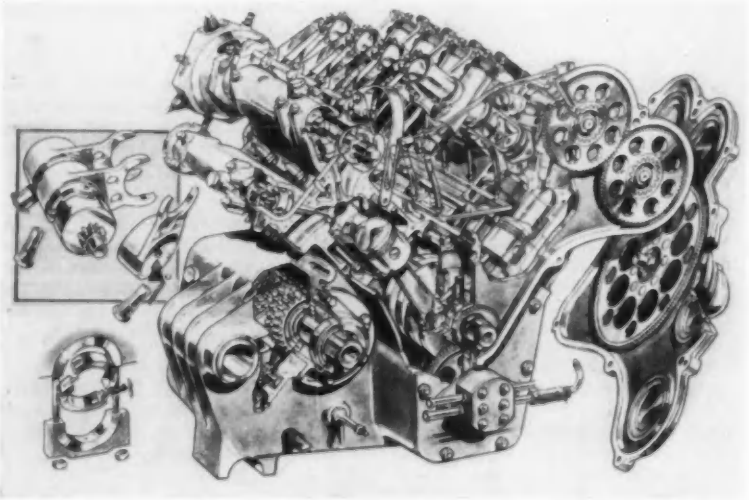
(*Turn to page* 160, *please*)

News of the AUTOMOTIVE



FLEXIBLE ASSEMBLY LINE AT CATERPILLAR PLANT

Wheel tractor assembly line rises to permit tire installation without having to lift the machine at the recently dedicated motor grader and wheel-type tractor plant of Caterpillar Tractor Co. in Decatur, Ill. This 300-hp DW21 tractor will be tested and then move on to the paint booth for steam cleaning, one prime and two finish coats of Caterpillar yellow before being driven away under its own power.



ITALIAN WATER-COOLED V-8 MOTORCYCLE ENGINE

This unusual motorcycle engine, built by Moto Guzzi of Italy, has a displacement of 30.5 cu in. and develops 62 bhp at 12,000 rpm with a compression ratio of 10.5 to 1. Bore and stroke are 1.73 in. by 1.61 in., respectively. The two banks of cylinders are of light alloy with water jacket shoulders internally threaded to receive the screw-in, cast-iron wet liners. The two sets of twin overhead camshafts carry individual four-contact, low-tension distributors and operate the water oil pumps. Each cylinder has its own spark coil and carburetor. Top inset shows gear selector mechanism, while lower one shows main bearing assembly. The machine weighs 340 lb in full racing trim. (Drawing by courtesy of Motor Cycling, England.)

Two Top Chrysler Executives Assigned To New Department

Chrysler Corp. has followed the pattern of General Motors and Ford in setting up a Dealer Relations Dept. Its principal function will be to act as a liaison between automobile dealers and top Chrysler management.

Operating relationships with dealers and all activities having to do with sales will continue to be handled by the sales departments of respective car divisions and the corporation sales office. The new department, however, will now be able to explore more closely problems with individual dealers through personal contacts.

Two of Crysler's top executives have been assigned to head up the new department. They are Nicholas Kelley, Jr., vice-president in charge of organization, and Robert C. Somerville. The latter recently was detached from his sales department responsibilities to serve as an assistant to Chrysler Corp., president, L. L. Colbert, on dealer relations.

Willys Turkish Unit Starts Jeep Output

Turk-Willys-Overland, A.O., jointly owned by Willys Motors, Inc. and Turkish interests, has started production of jeeps at its plant near Istanbul. Initial production will come from parts made in the U. S., but forward planning calls for a larger percentage of Turkish-made parts.

The Turkish company also plans to manufacture, assemble, and sell heavy trucks under license from Bussing Industries, a German manufacturer. Cost of the Istanbul plant was more than $2 million, of which Willys supplied 25 per cent.

"Home" Of Model T Dedicated By State

The Highland Park, Mich., plant, where Henry Ford built the first Model T on a moving assembly line in 1913, has been dedicated as a state historic site by the Michigan Historical Commission. Used currently to assemble trucks, tractors, and industrial engines, it is also a supply source for paints and kindred items.

AND AVIATION INDUSTRIES

Automobile Workers Get Cent-An-Hour Increase

A further rise in food prices has nudged wages up a penny an hour for workers in automotive, aircraft, and farm equipment companies which have contracts tied to living-cost provisions. In addition, most automobile workers have received the usual annual "improvement factor" wage increase amounting to six cents an hour or 2½ per cent of their straight hourly wage, whichever is greater.

The cent-an-hour increase is based on the Bureau of Labor Statistics Index, which rose from 114.6 in January to 114.9 on April 15. The next adjustment in the cost-of-living allowance will be made in September based on the July 15 index.

Under contracts signed with the union last year, the "improvement factor" increase went into effect on June 1 at Ford, American Motors and Studebaker-Packard and on May 28 at General Motors. Chrysler workers on June 1 received only the penny cost-of-living increase, since the improvement factor was paid on April 1.

Metal Shield Saves Time In Two-Toning Car Fender

Buick has solved the problem of painting a front fender two different colors without sending it through the spray line twice. The answer has been found in a six-in. metal shield with small hooks which is fitted into the holes where the fender trim is bolted.

The shield runs the length of the fender behind the wheel cutout and projects out at right angles. It permits one man to spray the top color and a second one the bottom portion without overlapping or splashing the paint.

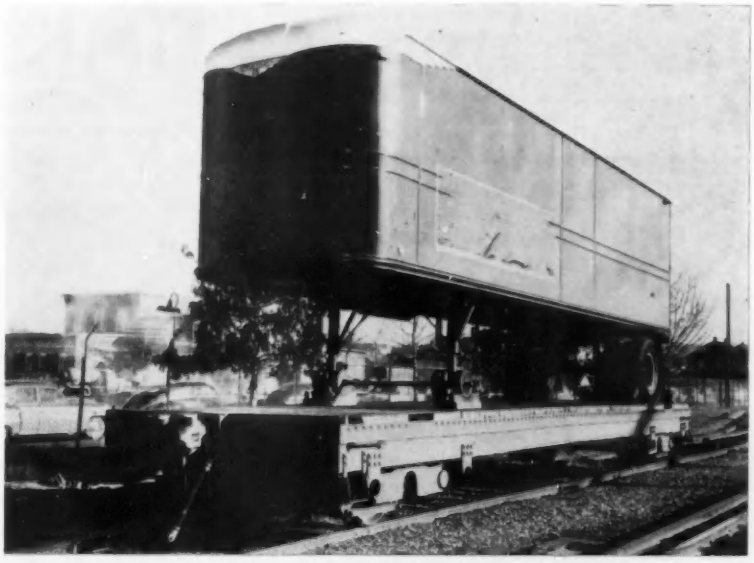
Two Air Force Contracts Awarded to Continental

Two contracts totaling more than $8.2 million have been awarded to Continental Aviation and Engineering Corp. by the Air Materiel Command at Wright Patterson Air Base, Dayton, O. The contracts are for gas turbine compressors and J-69 engines.

(*Turn to page 94, please*)

ENGINE WRAPPED IN PLASTIC FOR OVERSEAS USE

Cocoon of airtight plastic, developed by Bristol Aero-Engines, Ltd., protects engines exported from Britain. On a framework of strips of adhesive paper placed around the engine are sprayed a webbing compound and then two separate coats of plastic. Zippers are then stuck on and covered with adhesive tapes.



ALL-IN-ONE RAIL CAR FOR MULTIPLE USES

Built by American Car & Foundry Div. of ACF Industries, Inc., the Adapto is a new type of railroad flat car. Measuring only 35 ft long, it has provisions for interchanging attachments for quick conversion to gondola, box car, refrigerator, tank car, or "piggyback" service. Special features are fixed axles, air-cushioned suspension, rubber draft gear, roller bearings, and a self-cleaning floor.

You mean what you say, when you say "TIMKEN"

IF you are content with just any old kind of tapered roller bearing, steel or rock bit, of course you don't specify "Timken". By the same token, when you want highest quality you don't specify anything *but* "Timken". To make sure you get what you want—to safeguard your reputation and ours—we stamp "Timken" on every product we make. When you say "Timken" we know you *mean* a product made by the Timken Company . . . because, as everyone is aware, "Timken" is a trade-mark, not *just a type of product.*

When you purchase tapered roller bearings, alloy steel bars, seamless steel tubing or removable rock bits, always look for this famous legal identification. When you see it, you know there are over 55 years of experience behind it. When you *say* it, you're saying exactly what you mean: "I want the best." The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS • REMOVABLE ROCK BITS • FINE ALLOY STEELS

Men in the News

Vanadium Corp. of America — John B. Girler has been elected assistant vice-president and general manager of sales.

Cincinnati Milling Machine Co.—Walter W. Tangeman was elected chairman of the board, and Swan E. Bergstrom was named executive vice-president.

American Motors Corp. — Bernard A. Chapman has been elected vice president in charge of operations.

United Aircraft Corp.—**H. M. Horner** was named chairman of the board; **William P. Gwinn,** president and chief administrative officer; **Leonard S. Hobbs,** vice-chairman; **Wright A. Parkins,** vice-president; and **Arthur E. Smith,** engineering manager of the Pratt & Whitney Aircraft Div.

Curtiss-Wright Corp. — **Robert J. Maroni** has been named director of military sales, and **Norman J. Davidson** has been made director of commercial sales.

Heli-Coil Corp. — **Eduard Baruch** has been chosen president; **Walter Mann,** executive vice-president; **John Tucker,** assistant secretary and treasurer; and **Louis R. Ripley,** chairman of the board of directors.

Northrop Aircraft, Inc.—**Robert R. Miller** has been named vice-president and general manager; **C. Hart Miller,** vice-president for administration; **George Mangurian,** chief analytical engineer; **Roy P. Jackson,** assistant chief engineer; and **Jack Mannion,** assistant to the vice-president and general manager.

Pastushin Aviation Corp. — **Wayne Goldie** has been made director of engineering and sales.

Michigan Tool Co.—**Edward Sautter** has become controller, and **Robert W. Ferguson** has been made assistant secretary and assistant treasurer.

Seiberling Rubber Co. — **Harry P. Schrank** was elected executive vice-president.

Buick Motor Div., General Motors Corp.—**J. B. Nash** was named executive assistant to the general manager in charge of dealer relations.

Walker Manufacturing Co.—**Rea I. Hahn** was elected president.

Midland Steel Products Co.—**Wade N. Harris** was elevated to president, and **William A. McKinley** was elected chairman of the board.

Chevrolet Motor Div., General Motors Corp.—**Ivan X. Sarvis** was appointed executive assistant to the general manager in charge of dealer relations.

L. O. F. Glass Fibers Co.—**Clinton F. Hegg** has been named general sales manager.

Caterpillar Tractor Co.—**Lloyd J. Ely** was named director of manufacturing.

Vickers, Inc.—**Owen C. Davis** has been elected treasurer.

Potter and Johnston Co. — Gordon W. Smithson has been named vice president and chief engineer.

Detroit Universal Div., Chrysler Corp.—**James D. Cannon** was appointed manager of production sales.

Vanadium Corp. of America—**Raymond H. Filsinger, Jr.,** has been made corporation sales manager; **Roy F. Hancock,** head of the new Sales Promotion Div.; and **George W. Johnson,** manager of the unified Steel Foundry and Iron Foundry Divs.

Federal-Mogul Div., Federal-Mogul-Bower Bearings, Inc.—**Albert B. Willi, Jr.,** has been promoted to executive engineer.

Fafnir Bearing Co.—**Clarence G. Rosensweig** has become president; **Stanley M. Cooper,** chairman of the board; and **Richard F. Cooper,** vice-president in charge of manufacturing.

J. I. Case Co.—**W. C. Duesler** is now vice-president for sales; **W. B. Peters,** treasurer and comptroller; and **Leon T. Newman,** secretary.

Turn to page 168, please)

Necrology

Sidney C. Probert, 67, retired director of production research for Timken-Detroit Axle Co., died May 14, at Detroit, Mich.

John J. Caton, 76, founder of the Chrysler Institute of Engineering, died May 16, at Phillipsburg, N. J.

Edward E. Reardon, 55, controller of the Budd Co., died May 25, at Jenkintown, Pa.

William E. Ireland, 47, vice-president of sales for B. F. Goodrich Co. of Canada, Ltd., died May 21, at Kitchener, Ont.

Percy Owen, Sr., 81, one-time president of the old Liberty Motor Car Co. and chief of the Automotive Div. of the Dept. of Commerce, died May 31, at Petoskey, Mich.

William H. Hoult, 66, retired Chevrolet engineering executive, died May 16, at Bradenton, Fla.

John S. Worley, 80, Professor Emeritus of Transportation Engineering at the Univ. of Michigan, died May 25, at Detroit, Mich.

Wallace W. Smith, 70, a retired assistant vice-president of Inland Steel Corp., died May 14, at Freeport, Ill.

Thomas F. Rogan, a vice-president of Continental Motors Corp., died May 29, at North Muskegon, Mich.

THE NEW STYLE NO. 48-B TOOL GRINDER is used for roughing and finishing large tools that do not require extreme accuracy. Also used for roughing or semi-finishing smaller tools.

THE NEW STYLE NO. 49-A TOOL GRINDER is a heavy-duty model. It is recommended for roughing and finishing large single-point tools or roughing smaller tools.

Simple operation allows quick training of inexperienced help—

There's a new Ex-Cell-O Tool Grinder to fit the needs of every shop, large or small. Designed for simple operation, you can quickly train even inexperienced help to become proficient at tool reconditioning.

Ex-Cell-O Tool Grinders accommodate a wide range of tool sizes and sharpen all grades of carbides, high speed steels, and cast alloys. They feature: sturdy construction, vibration-free operation, generously proportioned work tables, simple and exact angular adjustments, and table adjustment for wheel wear. All models are double end with reversible motors for left and right hand tools.

New Ex-Cell-O Tool Grinders

GIVE YOU THE FINEST CUTTING EDGES

THE NEW STYLE NO. 46-D TOOL GRINDER can be used for finish grinding and also for roughing small and medium tools.

THE NEW STYLE NO. 44-A TOOL GRINDER is a precision finishing grinder. An Ex-Cell-O Precision Spindle drives six-inch plate mounted wheels.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

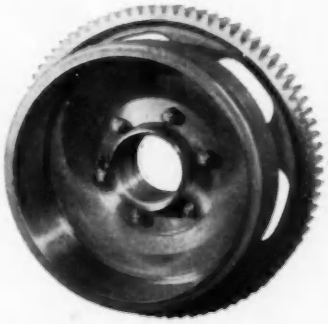
XLO
EX-CELL-O for PRECISION

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-14

On Link-Belt's new one yard shovel...

ELASTIC STOP® nuts remain tight under terrific shock loads



Elastic Stop nuts secure clutch drums to gears.

The engineering concept behind Link-Belt's new LS-98 Shovel-Crane provides a highly portable machine with big shovel characteristics plus stepped-up work cycles that produce substantial increases in capacity. To do this, the shovel-crane had to be built to stand up under heavy vibration and extreme shock loads. That's why Elastic Stop nuts were chosen for the critical fastening jobs throughout (i.e., hook rollers to brackets, clutch drums to gears, counterweight to upper frame, drum laggings to brake drums, engine mountings, side housing to revolving frame, etc.).

The locking principle of Elastic Stop nuts has been tested and proved by over 25 years of actual field service on equipment like this in every conceivable product of industry from locomotives to roller skates. What's special about this nut? For one thing, you can "stop" it at any position on the threaded length of the bolt . . . or wrench it tight against the work. No matter where you leave it on the bolt, it will remain tight in that exact position, even though you subject it to heavy vibration and shock loads. Reusable many times.

Elastic Stop nuts are available from a watchmaker's 0-80 all the way to 4"—in stainless steel, brass, aluminum and other alloys. Protect *your* product with "fastener insurance." We'll supply free test samples.

ELASTIC STOP NUT CORPORATION OF AMERICA

2330 Vauxhall Road, Union, N. J.

Elastic Stop Nut Corporation of America
Dept. N7-65, 2330 Vauxhall Road, Union, N. J.

Please send me the following free fastener information:

☐ ELASTIC STOP nut bulletin

☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name_____ Title_____

Firm_____

Street_____

City_____ Zone_____ State_____

60 second tour

shows it in a nutshell . . .

All-Inclusive Spring Service

COMPRESSION SPRINGS
Regular, Double

COMPRESSION SPRINGS
Special Shapes
Variable pitch

VOLUTE SPRINGS
Coned end

EXTENSION SPRINGS
Special Hooks
and Loops

EXTENSION SPRINGS
Swivel End
Drawbar

TORSION SPRINGS
Single, double
Edge wound

POWER SPRINGS
Clock or Motor

FLAT SPRINGS
Arched, Curved-beam
Elliptical

CLIPS, CLAMPS
and COLLARS

FASTENERS and
RETAINERS

HAIRSPRINGS
for Instruments
Gauges, etc.

SPRING WASHERS
Wavy, Star, Finger,
Expander, etc.

BELLEVILLE SPRINGS
In Series, Parallel
Parallel-series

DIAPHRAGMS
Discs, Plates

PLUS
COLD-ROLLED
SPRING STEEL

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RAYMOND Manufacturing COMPANY
CORRY, PENNSYLVANIA

BARNES-GIBSON-RAYMOND
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PLYMOUTH, MICH.

B-G-R COOK PLANT
ANN ARBOR
MICHIGAN

SEABOARD Coil Spring Div.
1900 S. BROADWAY
GARDENA, CALIF.

OHIO DIVISION
1815 EAST FIRST ST.
DAYTON, OHIO

WALLACE BARNES COMPANY
STATE FAIR BLVD.
SYRACUSE 9 (Salina), N.Y.

MILWAUKEE DIVISION
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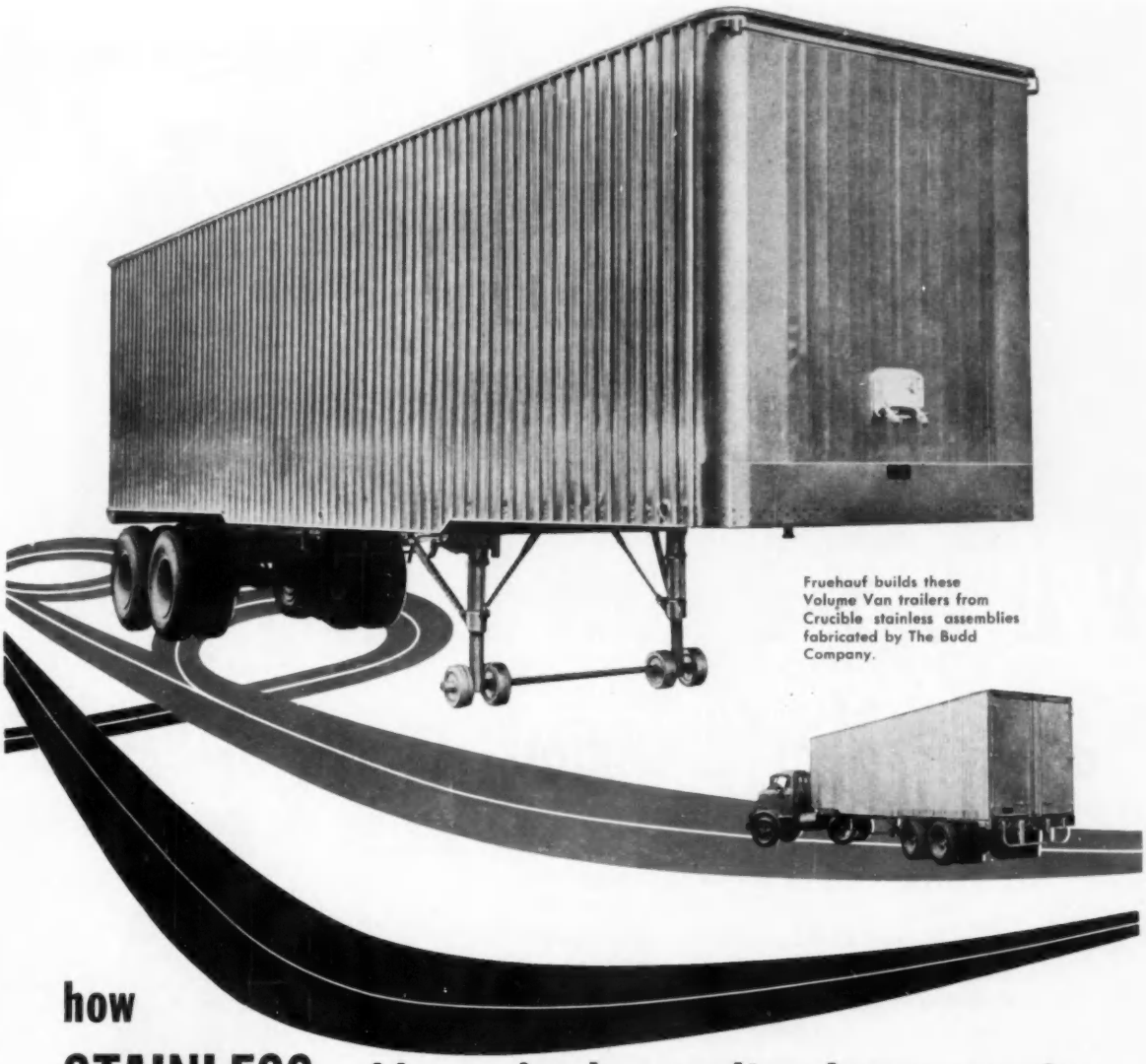


Fruehauf builds these Volume Van trailers from Crucible stainless assemblies fabricated by The Budd Company.

how STAINLESS adds payload capacity—lowers costs

Cargo capacity and profits go hand-in-hand in the transportation field. And stainless steel's high-strength gives this Fruehauf *Volume Van* trailer construction advantages that add up to carrying capacity above that of other van type trailers.

Stainless steel provides extreme rigidity and toughness, yet reduces dimensions of side walls, roof tension sheets, and front and rear panels. As Fruehauf says:

"Not only is there a gain in cubic capacity as well as strength, but an actual saving in weight so that the net result of the complete design is a transportation unit which will provide the highest possible return on the initial investment."

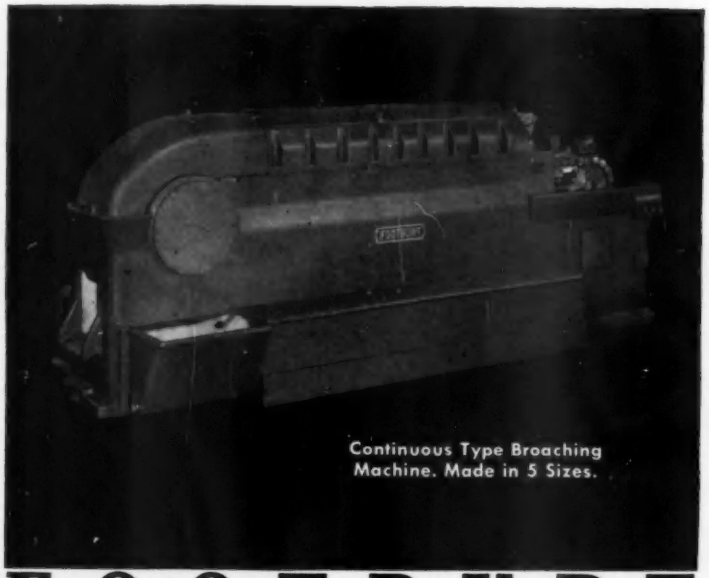
And stainless lasts indefinitely. In fact, there's a tradition in the industry that "no stainless steel trailer has ever worn out." For stainless resists wear, fights corrosion, takes a lot of punishment before it will scratch or dent. Maintenance is greatly reduced.

Should your product use stainless? It may be the answer to greater efficiency, lower costs, a more attractive product for you, too. Ask your local Crucible representative, or write *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

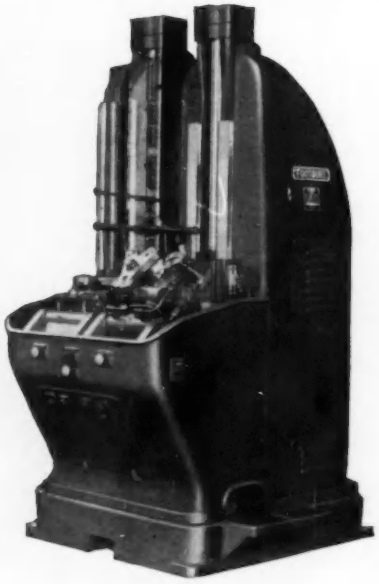
Crucible Steel Company of America

Canadian Distributor — Railway & Power Engineering Corp., Ltd.



Continuous Type Broaching Machine. Made in 5 Sizes.

Duplex Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.



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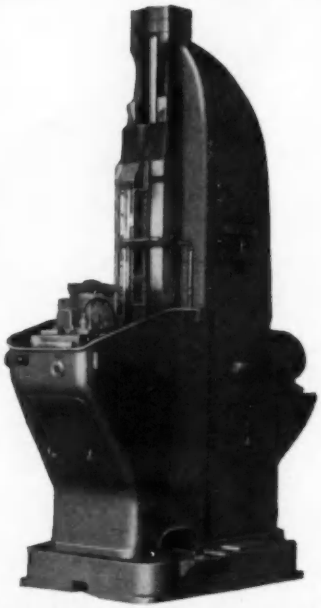
a faster *More Economical* machine operation

■ Footburt Surface Broaching may be the answer to your problem of faster machining. Many jobs that were slow and expensive when handled by conventional machining methods are now being produced by Surface Broaching. Production in most cases is as fast as the speed at which parts can be loaded. Yet cutting speeds are so low that the cost of tool maintenance shows great savings. Exceptional finish can be maintained. We will gladly discuss your machining problems with you.

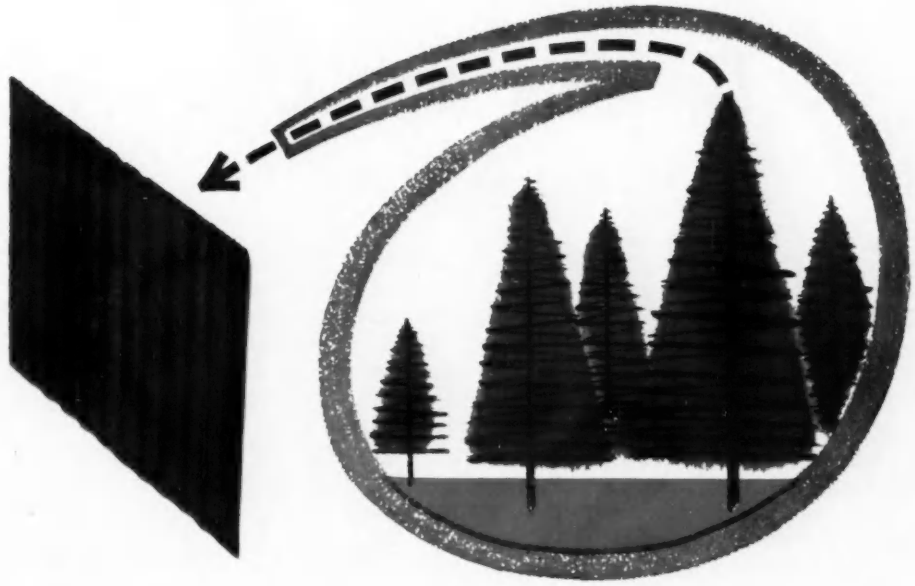
THE FOOTE-BURT COMPANY
Cleveland 8, Ohio • Detroit Office: General Motors Building



Single Slide Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

FOOTBURT

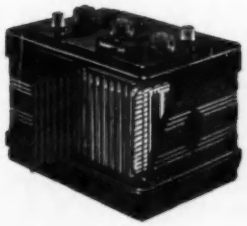
PIONEERS IN SURFACE BROACHING



NOW modern wood chemistry brings you better battery separators!

When you start with wood to make a good, low-cost battery separator, you retain all of wood's advantages. Then, when you apply Evans' newly developed chemical processes—using Evans' new production equipment – you get the *extras*, like high uniform porosity, extremely high acid resistance, superior wettability and permeability, low web thickness, outstanding mechanical strength in the battery, and resistance to abrasion and oxidization. Controlled swelling after insertion in the battery results in a tight element which resists vibration under every road condition.

If your battery manufacturer is not using Evanite® now, urge him to write for our latest research information. We'll be glad to ship him samples, too.



EVANS PRODUCTS COMPANY, Dept. P-6, Plymouth, Mich.—makers of the new Evanite high-performance, low-cost battery separator.

Plant: Coos Bay, Oregon. ***Sales Offices:*** Plymouth, Mich.; Coos Bay, Ore.; New York, N.Y.; Chicago, Ill.; Tampa, Fla.

EVANITE

is a registered trademark of Evans Products Company

EVANS PRODUCTS COMPANY also produces: bicycles and velocipedes; DF railroad loading equipment; truck and bus heaters and ventilating systems; and Evaneer fir plywood

The Year Isn't Over

By James R. Custer

THE decline of passenger car production has come as no surprise. To find anyone who believed otherwise would be very difficult.

What is happening is in keeping with the historical pattern of the automobile industry. Similar situations have existed in the past and we do not have to look far to find some examples.

Remember the vacuum after World War II, how production continued to rise until it hit the 6,666,000 mark in 1950. It was conceded generally that this all-time high would stand for many years. Yet only five years later it fell.

The 1950 mark was challenged in 1953 when the 12-month production rose to 6,117,000 cars. 1954 came and the first three quarters of that year were not very promising. The prophets of gloom came out of hiding. Fears grew as production slipped, but the total output finally went to over 5½ million units with the help of a year-end rally.

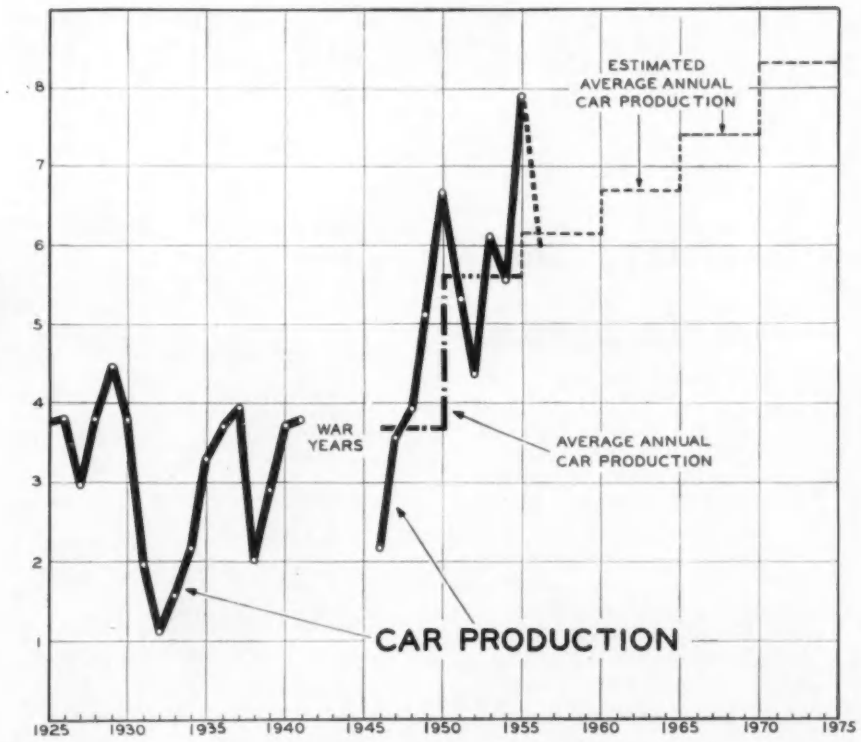
Most 1955 models made their appearance during the fourth quarter of 1954. Then in November and December began a terrific upsurge in car buying that continued through 1955 and ended in a new record of 7,920,000 cars amounting to a retail sales volume of at least $20-billion, another record.

That 1956 would be an off year in the automobile industry was a foregone conclusion as a natural sequence of events. Production has always had a peak and dip pattern, both monthly and yearly. Yet the long range trend continues upward as shown by the accompanying charts. For the industry to operate on a plateau for a long length of time could be ominous.

The automobile industry has met difficult situations in the past—successfully. Its record is one of dynamic action, a symbol of progress by unveiling every year appealing improvements in design and production techniques. One of the best examples in the free competitive enterprise system, the automobile industry has contributed immeasurably to making the United States the greatest industrial center in the world.

In our dynamic economy adjustments are an inherent part of it. The Federal Reserve Board endeavors to prevent maladjustments, but the tight credit policy it began a year ago is now having deflationary results and an adverse psychological effect on buying. It is good to restrain credit expansion to prevent inflation, but not to the extent that it will cause deflation and recession. A relaxation of that policy is needed and according to recent reports that course is underway.

More than ever, industry must evaluate the future and make its plans accordingly. A continued growth of the economy is foreseen for the next ten years. For this year industry in general plans an increase of $6-billion in capital expenditures, about 20 per cent higher than last year's figure. Likewise, the automotive companies are continuing their



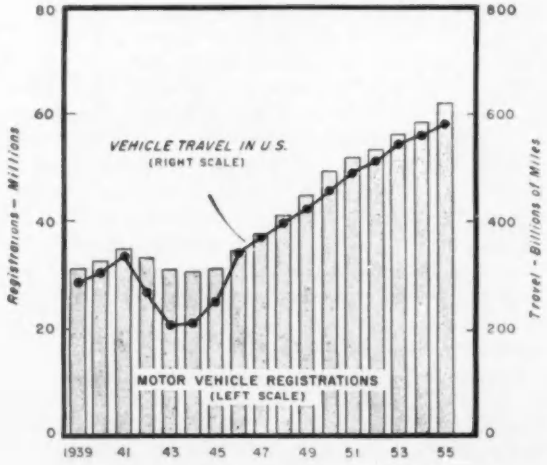
Source: Automotive Industries' Statistical Dept.

CAR PRODUCTION TREND

plant expansion and new equipment programs with an outlay of between $2- to $3-billion in 1956.

The first quarter of this year was considered "fairly good," but when an upturn in car sales failed to materialize in April as in past years, there was much concern, rightfully so. A study of the situation revealed some unforeseen factors, such as the long winter with no spring, and particularly a buyers' apathy due to big expectations of revolutionary styling and mechanical improvements in the 1957 models, although contrary to the historical development of yearly models. This deferred buying is expected to give an unusual impetus to sales in the fourth quarter when the new models are introduced. At this writing sales are reported on the upturn.

Yes—1956 will be a mighty good year—approximately 6-million cars and 1-million trucks rolling from the assembly lines.



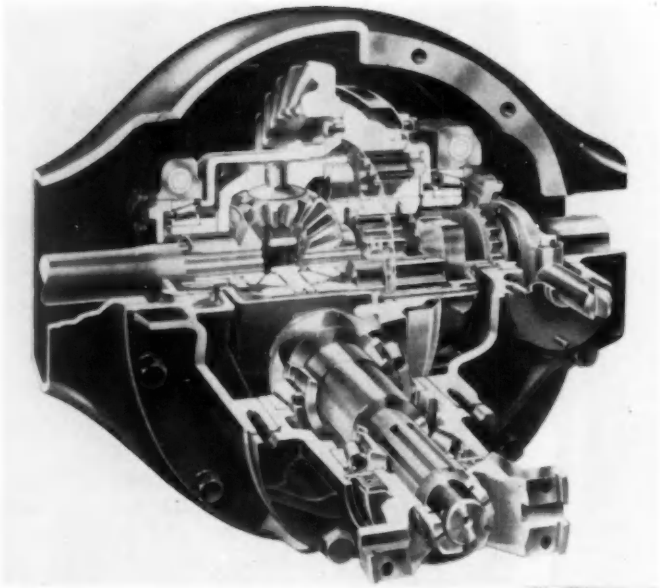
Source: National Research Bureau, Inc., and U. S. Dept. of Commerce

MOTOR VEHICLE REGISTRATIONS AND HIGHWAY TRAVEL

Heat Treating Alloy Steels

for

Heavy Duty Axle Service



Six different nickel alloy steels—4817, 94B17, 8620, 8720, 8645, and 8640 —are used in various parts of this Eaton two-speed truck axle

CURRENT production at Eaton Manufacturing Co. includes many sizes of the single reduction, double reduction, tandem and two-speed types, varying in carrying capacity from 11,500 lb to 21,000 lb per axle.

In most truck operations today, axles are subjected frequently to peak loads. To withstand the severe stresses imposed, gear and shaft steels must be of the highest quality.

The Eaton two-speed axle contains 15 major nickel alloy steel parts. It is a combination unit, making available two different axle gear reductions, giving the truck flexibility for both high-speed operation and maximum pulling power. Either ratio may be selected easily and instantly. This is accomplished by the addition of planetary gears and a simple shifting mechanism to conventional driving axle.

When the axle is in the high ratio, the planetary gears are locked and the unit functions as a conventional axle driving through a rugged pinion and a matched bevel gear. When the axle is shifted to the low ratio, planetary gears come into operation and through them a secondary reduction is obtained.

Range of Nickel Alloy Steels Used

The several nickel alloy steels used in the various parts of this heavy-duty axle are given in Table I. Years of experience have demonstrated the importance of using such materials in such severe service.

During World War II, and again during the Korean War, industry was forced to revert to substitutes due to the extreme demand for nickel by the military services. The substitutes imposed upon industry on these occasions were dropped in nearly all instances just as soon as nickel again became available for making steel for use in heavy-duty truck work.

These steels are purchased to hardenability specifications. The ease of shop handling is exemplified by the annealing operation. Regular practice at the Eaton plant is to cycle anneal many of these different grades simultaneously in the same controlled-atmosphere annealing furnace to produce good machinable structures with hardnesses in the conventional machining ranges.

One of the annealing cycles which is customarily employed is illustrated in Table II, and Table III shows the typical ranges of hardnesses developed in daily production. Not only do these furnaces provide desirable structures for machining, but even more important, parts are completely free from scale.

Case Hardened Steels

Carburizing facilities at Eaton are radiant tube continuous gas carburizers. The low carbon alloy steels in Table I are carburized in these furnaces at 1700 F. In all instances carbon content of the case, case depth, microstructure and distortion are closely controlled. Case depths range between 0.040 in. to 0.065 in., and are established according to the size of the parts and load which they will have to carry.

Drive pinions and drive gears are direct quenched from the carburizing furnaces and are subsequently tempered when specified. Some of the other gears are reheated and quenched, but, wherever possible, they are direct quenched. Side gears and helical gears with

TABLE I

Nickel Alloy Steels Specified for Eaton Axle Parts

(Composition and Properties)

Part	Steel	Type	Treatment	Hardness
Drive Pinions	94B17 H	Ni-Cr-Mo-B	Case hardened	File hard
Drive Pinions	4817 H	3½% Ni-Mo	Case hardened	File hard
Side Gears	94B15 H	Ni-Cr-Mo-B	Case hardened	57/63 Rc
Side Pinions	94B17 H	Ni-Cr-Mo-B	Case hardened	57/63 Rc
Drive Gear (over 15 in. diam.)	4817 H	3½% Ni-Mo	Case hardened	File hard
Spider	8620	Ni-Cr-Mo	Case hardened	57/63 Rc
Idler Pinion	94B17 H	Ni-Cr-Mo-B	Case hardened	57/63 Rc
Sliding Clutch Gear	94B17 H	Ni-Cr-Mo-B	Case hardened	57/63 Rc
Drive Gear (12 in. to 14 in. diam.)	8720 H	Ni-Cr-Mo	Case hardened	File hard
Side Pinions	8620 H	Ni-Cr-Mo	Case hardened	57/63 Rc
Spider	8620	Ni-Cr-Mo	Case hardened	57/63 Rc
Idler Pinion	8620 H	Ni-Cr-Mo	Case hardened	57/63 Rc
Sliding Clutch Gear	8620 H	Ni-Cr-Mo	Case hardened	57/63 Rc
Clutch Plate	8645	Ni-Cr-Mo	Quenched & tempered	50/56 Rc
Differential Bearing Adjuster	8640-42	Ni-Cr-Mo	Quenched & tempered	48/54 Rc

By T. A. Frischman

Chief Metallurgist, Axle Division

Eaton Manufacturing Co.

TABLE II

Typical Annealing Cycle at Eaton

Zone No.	Purpose	Recorded Temperature Range, deg F
1	Heating	1600 – 1680
2	High heat soak	1680 – 1700
3	Fast cooling	1135 – 1165
4	Holding	1010 – 1040
5	Holding	900 – 935
6	Fast cooling	605 – 630

internal splines, for example, are reheated after carburizing because they can be more conveniently quenched on sizing plugs in order to maintain the very close tolerance required on the internal splines. To insure highest quality in the drive gears and drive pinions, every tooth is tested with a standard test file.

Distortion in heat treatment is minimized by press quenching, time quenching, and close control of hardenability and depth of carburization. For example, the normal out-of-round and out-of-flat variance is in the neighborhood of 0.002 in. and must not exceed 0.003 in. for drive gears quenched on Gleason quench presses. Conditions are so closely controlled and the response of the steel so reliable that the distortion can ordinarily be held to these tolerances.

Through an identification system the history of every heat of steel used is carried on the important parts, thus giving immediate and accurate reference to the origin of the steel if needed.

TABLE III

Typical Ranges of Hardness Developed in Daily Production by the Single Cycle.

Type Steel	Hardness, BHN
8620–8720	143–163
4815–4817	170–207
8640–8645	187–207

The latest in production machining and heat treating equipment, combined with close metallurgical control and the dependable performance of the nickel alloy steels, operate to satisfy the demands of the heavy truck industry for axles capable of long trouble-free service under the severe conditions encountered in modern heavy duty truck operation.

• • •

Nickel-Saving Stainless Steels Considered for Automotive Uses

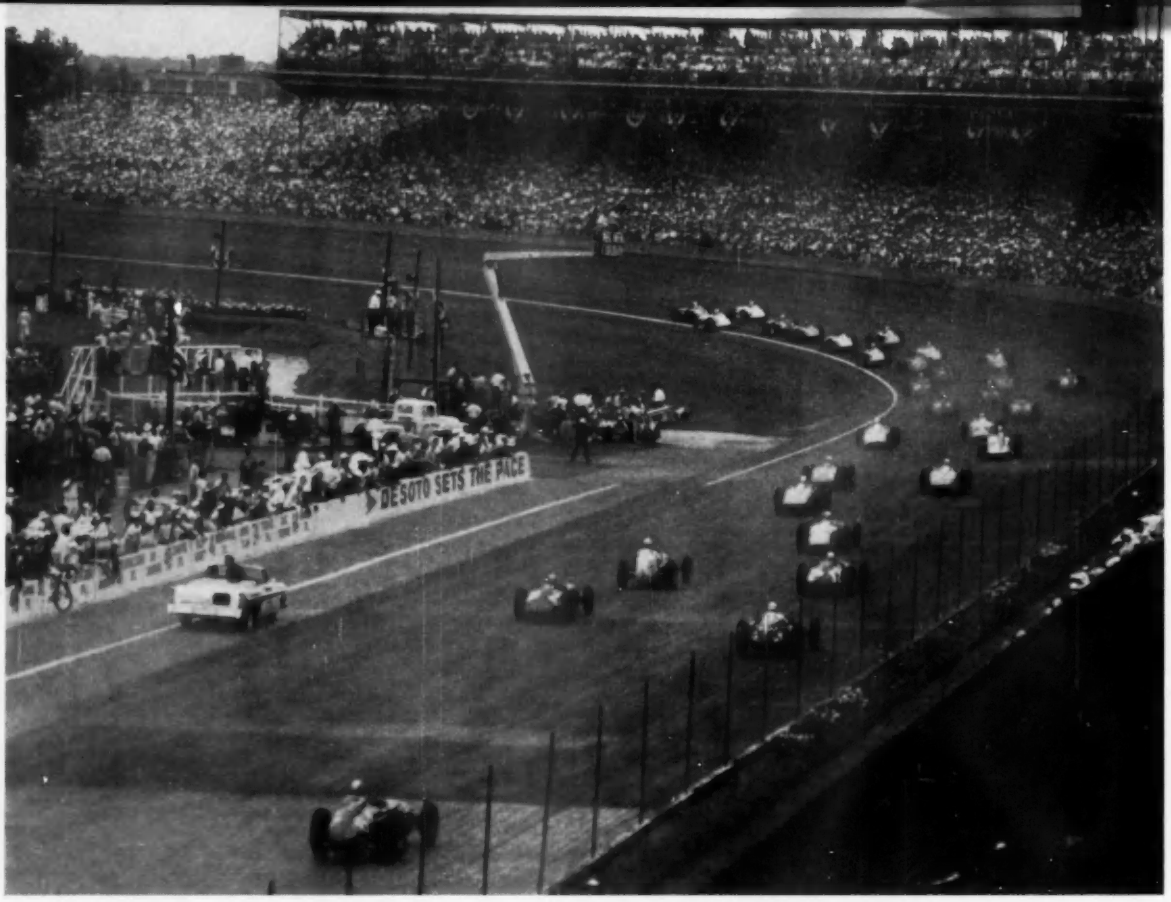
The extensive use of stainless steel trim on current passenger car models is resulting in a careful evaluation of new, nickel-saving stainless steels. These new steels—designated as Types 201 and 202—are said to offer a combination of good mechanical properties and corrosion resistance typical of austenitic stainless steels, but with considerably smaller amounts of nickel.

In the automobile industry, the major use of austenitic stainless is for full wheel covers. The new grades have been tested in this application, and one fabricator is in production with the new types.

At present, the industry is making extensive use of Type 430 stainless (which contains no nickel) for body trim. Parts such as body side moldings, window trim, grilles, stone shields, drip rails, and belt moldings are fabricated economically from this grade. More complex parts, such as wheel covers and door handles, are usually made from Types 301 and 302. They contain approximately seven per cent and eight per cent nickel, respectively.

The new Types 201 and 202, which are designed to serve as alternates to these grades, contain only four per cent and five per cent nickel, respectively. This factor can make it possible for stainless steel producers to provide almost 40 per cent more stainless steel with the same amount of nickel.

Production of the new grades depends, of course, on their acceptance by the automotive and other industries. However, in the first quarter of this year, production of the low-nickel steels had already more than doubled all of last year's output.



Start of first lap; pace car off on the apron; the field streams through the southwest turn.

Fantastic Five Hundred

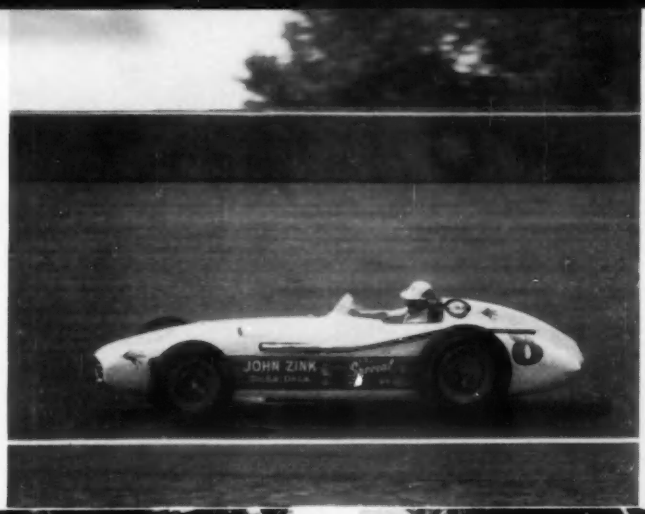
By Robert T. Jackson
Perfect Circle Corp.

FLASHING through a spin-infected field on a crash-dotted course, youthful Pat Flaherty of Chicago won the 40th annual 500 mile Indianapolis race. His average speed was 128.490 mph, an illuminating figure itself when one realizes that the caution signals were on for a *total of more than one hour* while the track was being cleared of wrecks and debris.

In numerous ways this year's race earned the dubious distinction of being the most unusual, if not unbelievable, contest ever held at the famous speedway. Spins and wall-kissing incidents were commonplace; the second, third, fifth, and sixth place finishers were involved in mishaps of one kind or another and the balance of the starting field was piling up wreck statistics quite busily throughout the afternoon.

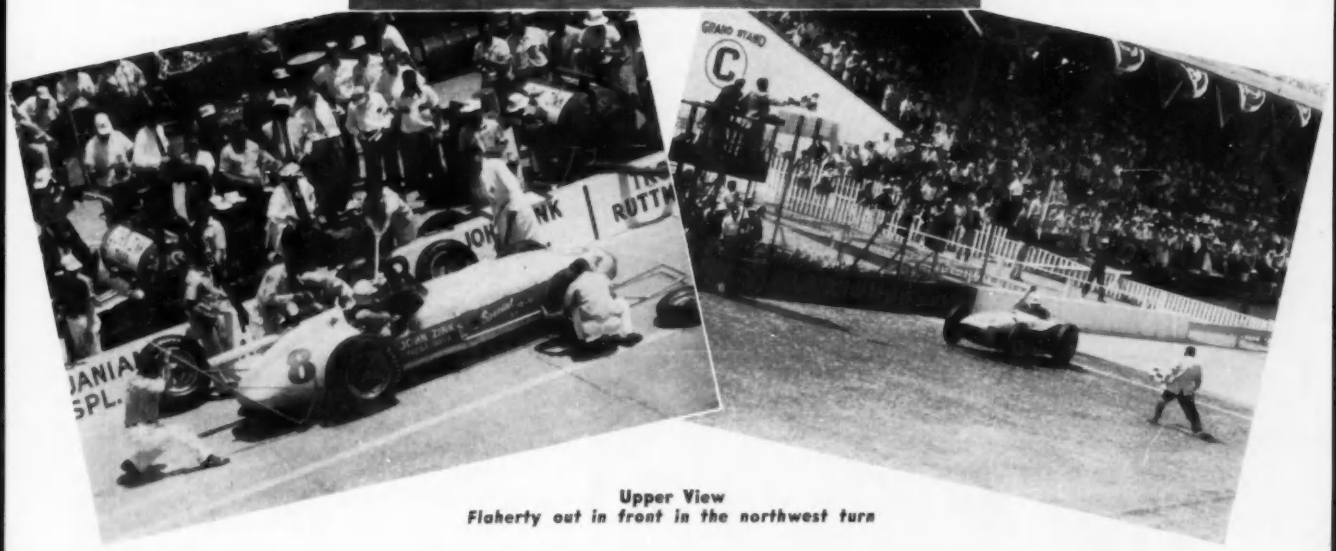
It was tough-dollar day for the old pros. Jimmy Bryan and Bob Sweikert, who had been counted on for most of the strong-finishing kicks, each suffered spins and resulting delays and were not among the contenders in the closing distances. Others from the veterans' ranks who tried out the walls were Jimmy Daywalt and Tony Bettenhausen. Fortunately for all, a merciful Providence withheld serious injuries, but the form book took a whipping.

Pat O'Connor, easily a top favorite, ran strongly until the later laps, when his engine faded. Troy Ruttman, always a strong figure on form, was eliminated by a spin in the early stages. And so it went—with all but Flaherty, who apparently could do no wrong. He not only avoided most of the serious moments but his car performed beautifully and he was never far off the pace. Considering the fact that he qualified his John Zink Special on the pole at a sizzling new-record speed and went on from there to win conclusively, one is justified in the statement that Flaherty literally and figuratively dominated the race.



Below — Flaherty's first pit stop—he had very quick service

Below—Pat Flaherty — Indianapolis winner. He waves acknowledgement to the emblem of victory — Starter Vandewater's checkered flag. (Perfect Circle photo—Don Beeson.)



Upper View
Flaherty out in front in the northwest turn

Spectacular Competition Mixed with Spins and Wrecks Thrills Crowds at Indianapolis Classic. Long Race Results with Caution Signals on for More Than Hour.

On the start, which was fair enough, Jim Rathmann pulled into the early lead from his middle spot in the first row and led for a lap or so. O'Connor and Flaherty then charged through and hustled things along until the tenth lap—when Paul Russo in the Novi Vespa Special swooped into the lead right at the starting line with a prodigious burst of speed.

Russo then led, going away, for the next ten laps, while Flaherty, O'Connor, and Jim Rathmann made up the hurtling second division. With terrific acceleration on the straights, Russo was able to stave off the not-too-insistent challenge of his runners-up (who may have been gifted by a premonition of what was to come very soon). At this point Russo's average speed was 142 mph plus!

Russo, entering his 21st lap, encountered some sort of difficulty which put him into the wall on the southwest turn. His car was wrecked but he escaped injury and actually leaped from the car then *ran* down across the track to the safety apron. O'Connor and Flaherty, following, slipped through safely but the next minute or so found the fans at the south end of the home straight gawking at a spin spree involving four cars and capped by a minor collision on the part of Johnny Thomson's Schmidt Special with Johnny Tolan's car standing in front of its pit at the time. A mechanic working on Tolan's car suffered a compound leg fracture when struck by Thomson's car but otherwise the damage done was largely to hopes of the contestants affected.

Troy Ruttman, who spun into the infield, was retired by this melee. So was Johnny Thomson, whose

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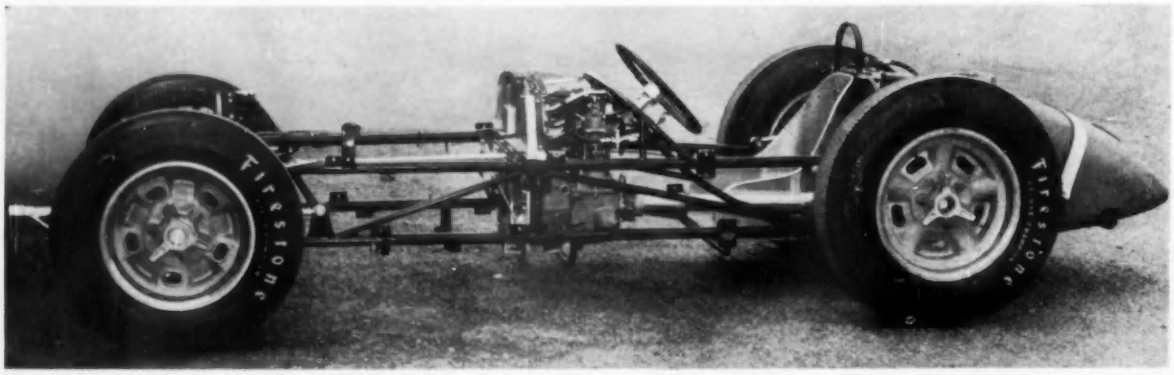
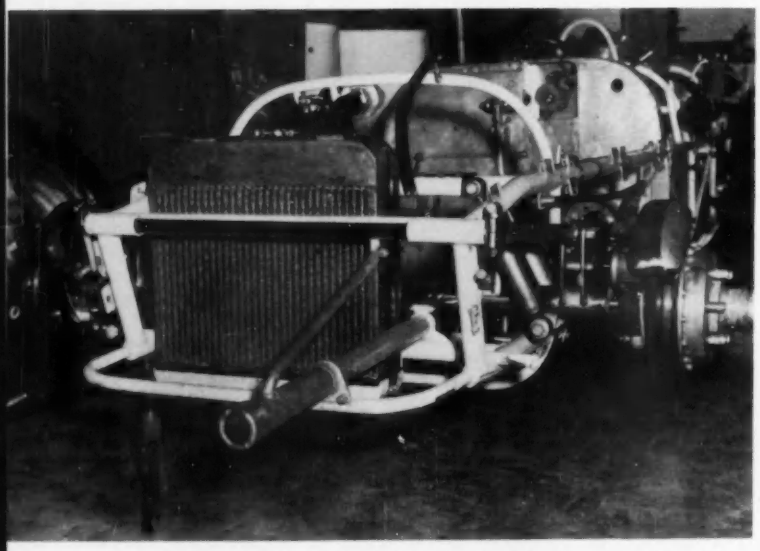
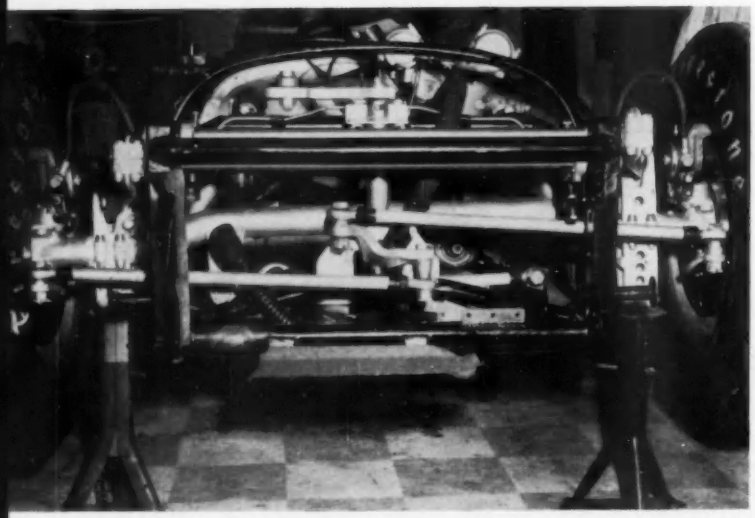


Frame structure of Bowes Seal Fast Special driven by Johnny Boyd. This new car, a Kurtis-Kraft 500G, is lower, lighter, and narrower than previous roadster types produced by Kurtis. Wheelbase is 96 in.; front tread 53 in.; rear is 50 in. Dry weight of car is said to be 1700 lb.



Front suspension arrangement of the John Zink special built by A. J. Watson, chief mechanic for Zink.



Front end details of Massaglia Hotels Special driven by Jimmie Reece. This new roadster type car was built by Luje Lesovsky. Felt-lined radiator shelf is at lower center.

car stalled just at the south end of the pits. Sam Hanks, ultimate second place winner, figured in the whirligig but was able to continue after a pit stop to replace a wheel, as was Keith Andrews in the Dunn Engineering Special, who had come to a halt just a little south of Thomson.

The spinfest started when officials at the starting line, with commendable fervor, were attempting to slow the rather tightly packed group down to the caution pace after the Paul Russo wreck. Whether brakes or otherwise, something locked in Thomson's car, his skid path became erratic and those near him had to look for some place else to be, with results noted above.

After his well-timed exit from the wrecked Novi, Paul Russo walked back to his pit, receiving an ovation from the crowded stands every step of the way. When racing speed was resumed, O'Connor and Flaherty repeatedly had the spectators gasping with an exhibition of close-running rivalry that lasted a good 10 laps.

During this interlude the lead shifted at least three times but Flaherty finally picked up a fairly useful margin by fancy work in the traffic which the fast-flying pair encountered. O'Connor was not to be denied, however, and booted his mount to the head end again at about 40 laps. From this he went on, getting a little the best of the breaks in rear-end traffic, to a several-second cushion which he held to his first pit stop—at his 55th lap.

Flaherty had also stopped on *his* 53rd lap. The stop dropped him below the first five for the following dozen laps but he began to work back up surely and rapidly. Meanwhile, on his 51st lap, Ray Crawford survived a

spectacular crash against the inner guard rail at the north end of the home straight (after bouncing off the *outer* wall) and the yellow light parading began all over again.

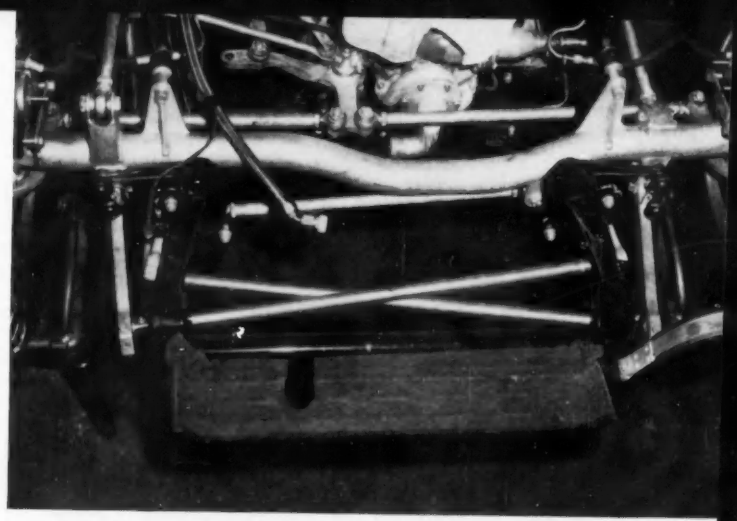
Not too long after this one was finally cleaned up, Al Herman, in his No. 12 Bardahl, bounced from inner guard rail to outer wall and back off the inner wall just at the starting line. The car rested right in front of the pagoda for many laps while the caution signals again were out. Naturally, no changes in relative positions took place during these intervals.

Spectators along the home straight thus were treated to a series of slides and crashes following the Novi's wreck but they had no monopoly on the excitement. The southeast turn was the scene of at least *four* crashes within a few hundred feet of each other as the race went through its second half.

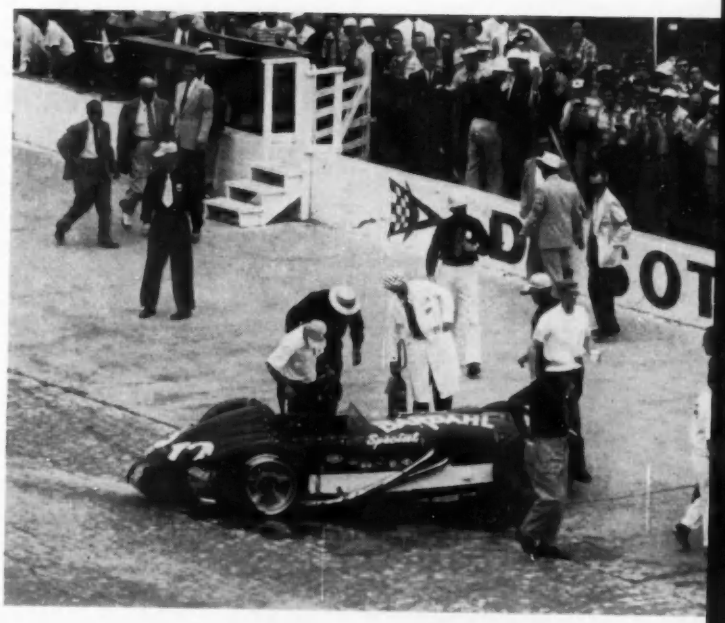
Meanwhile, all these caution signal periods notwithstanding, the standings were revised from time to time, as usual. Each time the 50 mile markers went by it became more and more apparent that Flaherty was destined for victory. Although a few others led the race for several laps at a time, it was Flaherty who came back after his second pit stop (at 132 laps) to be the front runner 'til the finish.

Sam Hanks, in his No. 4 Jones and Maley Spl., ran a heady race and his car functioned sweetly, but, quite obviously, was in no position to press his luck toward the finish. Considering everything, the second place he garnered was a relatively happy ending.

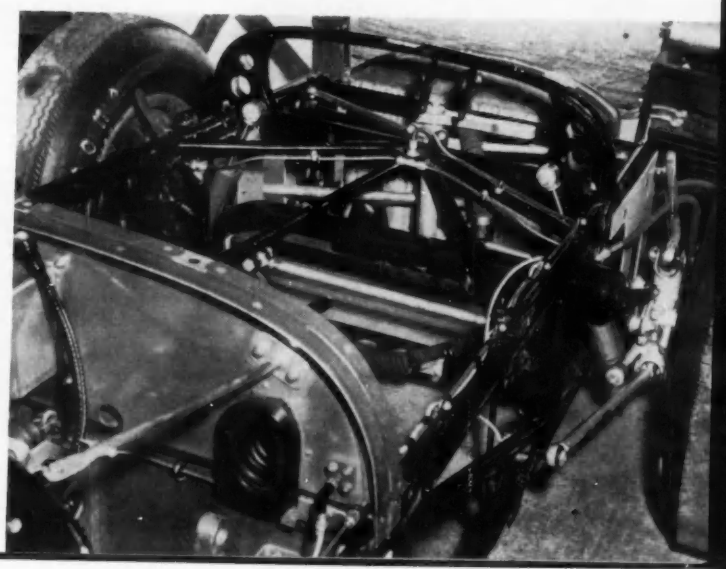
Don Freeland, third place finisher, was in strong contention most of the way and might have done better but for a brush with the wall which caused him to make an unplanned pit stop. *(Continued on next page)*



Steering and suspension details of Novi front end. (The felt-lined pan at bottom of picture is the radiator cradle). Triangular brackets inside of suspension perches are mounts for telescopic type shock absorbers which had been removed when this photo was taken.



Wrecks galore, among them this one of Al Herman's Bardahl No. 12, kept the race under the caution light for numerous long periods of time. Herman ricocheted off the inside wall of the home straight above the starting line, bounced to the outer wall, then back to the inner barrier right at the line, coming to rest as shown here—about 40 ft south of the officials station in front of the pagoda.



Revamped front end of Jones and Maley special, driven by Sam Hanks, features truss-braced vertical steering shaft; a new front axle and associated parts designed and built by chief mechanic George Salih. One of the new suspension perches is visible at right. Changes were made to improve steering geometry and security. Car is a Kurtis-Kraft 500C.

Johnnie Parsons, looking like the Parsons of old in J. C. Agajanian's spanking new Kuzma roadster, pushed things pretty fair all day—and got fourth. In his own words, when interviewed after the race, he expressed a thought which couldn't have been foreign to many of the contestants, "Boy, this has really been a *long* way." Dick Rathmann drove hard to fifth spot—then hit the southwest wall on his safety lap!

Bob Sweikert, after running beautifully close to the pace for the first half in what obviously was a planned gambit, suffered a spin and loss of a tire which caused him to lose lots of time running slowly back to his pit on the remains of his tire and wheel. Sweikert paved the way to a money finish rather than early retirement by de-clutching his car during the spin episode and keeping the engine running so he could continue.

Bob Veith, in seventh with his Federal Engineering Special, was a steady runner, as was Rodger Ward in the Filter Queen Special; Jimmy Reece, ninth in his Massaglia Hotels Special, kept everything lined up at all times; while Cliff Griffith, tenth in the Jim Robbins Special, earned the praise of numerous fans by bringing home the only non-roadster in the money list.

As it happens, this thought is opportune for shifting to the technical side of the race — for it is now quite obvious to all that the roadster type chassis is here to stay at Indianapolis. Actual statistics alone support this view; out of the 33 starters 29 were roadsters. Three were more or less outright dirt track machines and one — the Robbins car — actually was built with Indianapolis in mind but is compromised toward the typical dirt track layout.

Actually, the vagaries of the weather again entered into the qualifying trials to the extent that the orthodox dirt track cars which started probably would not have made the field if good weather had been available for each day of the trials.

To define the term roadster as used loosely around the track is not precise or simple. Granting the use of some personal opinion, the roadster appears to be a machine with a round steel tube, truss-welded, girder-type frame structure; offset (that is, with engine and drive line located at least six or so inches left of center, enabling the driver's seat to be placed low, on the right side of the drive shaft); with very low overall body height (averaging 32 in. or so) but substantial body width; major axis of tail tip horizontal rather than vertical; engine may or may not be inclined to

(*Turn to page* 117, *please*)

1956 Indianapolis Race Story

SUMMARY OF RESULTS

Car No.	Car Name (Spl.)	Driver	Qualifying Speed (mph)	Engine Bore & Stroke (in.)	Laps Completed	Cause of Elimination (or No. of Pit Stops)	Place (& Av. Speed 1st Ten)
8	John Zink	Pat Flaherty	145.506	4.312x4.625	200	2	(1) 126.490
24	Hopkins	Jim Rathmann	145.120	4.395x4.500	175	Lost oil	
7	Ansted Rotary	Pat O'Connor	144.980	4.312x4.625	187	Out of time	
73	McNamara	Dick Rathman	144.741	4.405x4.500	200	Hit wall after finish, 3	(5) 126.133
99	Belanger	Tony Bettenhausen	144.602	4.312x4.625	160	Hit wall, wrecked	
98	Agajanian	Johnnie Parsons	144.144	4.375x4.500	200	3	(4) 126.631
42	Federal Engrg.	Fred Agabashian	144.069	4.312x4.625	196*		
29	Novi Vespa (S)	Paul Russo	143.546	3.200x2.840	21	Hit wall, wrecked	
5	Chapman	Andy Linden	143.056	4.375x4.500	90	Engine failure	
1	D-A Lubricant	Bob Sweikert	143.033	4.375x4.500	200	Spun but cont'd race, 2	(6) 125.489
53	John Zink	Troy Ruttman	142.484	4.332x4.625	160	Spun out, involved in collision	
15	Bowes Seal Fast	Johnny Boyd	142.337	4.405x4.500	35	Burst oil gauge	
4	Jones & Maley	Sam Hanks	142.051	4.332x4.625	200	Involved in collision but cont'd race, 2	(2) 128.303
10	Hoyt Machine	Ed Elisian	141.382	4.375x4.500	160	Ignition failure	
19	Filter Queen	Rodger Ward	141.171	4.312x4.625	200	1	(8) 124.990
48	Sumar	Jimmy Daywalt	140.977	4.375x4.500	134	Hit wall, wrecked	
49	Crawford	Ray Crawford	140.884	4.405x4.500	49	Hit guard rail, wrecked	
88	Schmidt	Johnny Thomson	145.549	4.312x4.625	22	Collision	
2	Dean Van Lines	Jimmy Bryan	143.741	4.375x4.500	185*	Spun but cont'd race	
89	Dunn Engineering	Keith Andrews	142.976	4.332x4.625	94	Involved in collision, trans. failure	
26	Massaglia Hotels	Jimmy Reece	142.885	4.312x4.625	200	1	(9) 124.938
82	Central Excavating	Gene Hartley	142.846	4.312x4.625	196*		
14	Federal Engrg.	Bob Veith	142.535	4.322x4.625	200	3	(7) 125.048
54	Travelon Trailer	Jack Turner	142.394	4.395x4.500	131		
57	Heise	Bob Christie	142.236	4.332x4.625	196*		
16	Bob Estes	Don Freeland	141.699	4.342x4.625	200	Car hit wall but cont'd, 3	(3) 127.668
12	Bardahl	Al Herman	141.610	4.395x4.500	74	Hit guard rail, wrecked	
55	Sam Traylor	Al Keller	141.193	4.375x4.500	194*		
41	Greenman-Casale	Bill Garrett	140.559	4.375x4.500	195*		
27	Jim Robbins	Cliff Griffith	141.471	4.375x4.500	199	2	(10) 123.471
34	Trio Brass Fdry.	Johnny Tolan	140.061	4.312x4.625	173*		
81	Central Excavating	Eddie Johnson	139.093	4.312x4.625	195*		
64	Shannon	Duke Dinsmore	138.430	4.375x4.500	191*		
			ALTERNATE STARTER				
	Brady	Eddie Sachs					

*—Running at finish—flagged. (Total of 19 cars running when leader finished.)
All cars rear drive. (S)—Supercharged, 183 cu in. displacement.
All engines four cylinder Meyer-Drake "270" except the Novi, which is a V-8 of own make.

Technical Data on Starting Cars

Car No.	Car Name (Spl.)	Driver	Chassis	Est. Dry Weight (lbs.)	Springs	Spark Plugs	Magneto
8	John Zink	Pat Flaherty	Watson '56 R	1700	Tr. Tor. Bar	Champion	Joe Hunt
24	Hopkins	Jim Rathmann	500C Kurtis	1825	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
7	Ansted Rotary	Pat O'Connor	500D Kurtis	1825	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
73	McNamara	Dick Rathmann	500C Kurtis	1800	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
99	Belanger	Tony Bettenhausen	500D Kurtis	1800	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Lodge	Joe Hunt
98	Agajanian	Johnnie Parsons	'56 Kuzma-R	1775	Trans. Tor. Bar	Champion	Joe Hunt
42	Federal Engineering	Fred Agabashian	500D Kurtis	1850	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
29	Novi Vespa	Paul Russo	500F Kurtis	1950	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	KLG	Bosch
5	Chapman	Andy Linden	500C Kurtis	1900	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
1	D-A Lubricant	Bob Sweikert	'56 Kuzma-R	1775	Trans. Tor. Bar	Champion	Joe Hunt
53	John Zink	Troy Ruttman	500D Kurtis	1800	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Lodge	Joe Hunt
15	Bowes Seal Fast	Johnny Boyd	500G Kurtis	1725	Trans. Tor. Bar	Champion	Joe Hunt
4	Jones & Maley	Sam Hanks	500C Kurtis	1850	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Lodge	Joe Hunt
10	Hoyt Machine	Ed Elisian	500C Kurtis	1800	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Lodge	Joe Hunt
19	Filter Queen	Rodger Ward	500C Kurtis	1800	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
48	Sumar	Jimmy Daywalt	500D Kurtis	1800	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
49	Crawford	Ray Crawford	500B Kurtis	1850	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
88	Schmidt	Johnny Thomson	'56 Kuzma-R	1775	Trans. Tor. Bar	Champion	Joe Hunt
2	Dean Van Lines	Jimmy Bryan	'55 Kuzma-R	1850	Trans. Tor. Bar	Lodge	Joe Hunt
89	Dunn Engineering	Keith Andrews	500B Kurtis	1800	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
26	Massaglia Hotels	Jimmy Reece	Luje Lesovsky '56-R	1825	Trans. Tor. Bar	Lodge	Joe Hunt
82	Central Excavating	Gene Hartley	'55 Kurtis Parts	1800	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Lodge	Joe Hunt
14	Federal Engineering	Bob Veith	500D Kurtis	1850	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
54	Travelon Trailer	Jack Turner	500B Kurtis	1800	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
57	Heise	Bob Christie	500C Kurtis	1800	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
16	Bob Estes	Don Froeland	500D Kurtis	1850	Fr.: Diag. Tor. Bar Rr: Tr. Tor. Bar	Champion	Joe Hunt
12	Bardahl	Al Herman	500B Kurtis	1750	Fr.: Diag. Tor. Bar	Champion	Joe Hunt
55	Sam Traylor	Al Keller	'48 Kurtis-D	1700	Fr.: Trans. Leaf R.: Long. Tor. Bar	Champion	Joe Hunt
41	Greenman-Casale	Bill Garrett	Kuzma-D	1650	Fr.: Trans. Leaf R.: Long. Tor. Bar	Champion	Joe Hunt
27	Jim Robbins	Cliff Griffith	Myron Stevens	1800	Fr.: Trans. Leaf R.: Long. Tor. Bar	Lodge	Joe Hunt
34	Trio Brass Foundry	Johnny Tolan	500D Kurtis	1825	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
81	Central Excavating	Eddie Johnson	Kuzma-D	1650	Fr.: Trans. Leaf R.: Long. Tor. Bar	Lodge	Joe Hunt
64	Shannon	Duke Dinsmore	500A Kurtis	1750	Fr.: Diag. Tor. Bar R.: Tr. Tor. Bar	Champion	Joe Hunt
			ALTERNATE STARTER				
..	Brady	Eddie Sachs	....	....	.....	.....	.....

All Kurtis 500 Series are "Roadsters."

R="Roadster" type. D=Dirt track type.

All cars had magnesium disc wheels and spot brakes. Average wheelbase 96". Average tread, 53".

All cars rear drive. All engines Meyer-Drake "270" four cylinder except Novi, which is V-8 of own make. All four cylinder engines used Hilborn fuel injectors and methanol base fuel. Novi used pressure-type carburetor and methanol-base fuel. Novi engine is 183 cu in., with centrifugal supercharger.

All engines used Perfect Circle piston rings except the No. 26 Massaglia Hotels Spl., which had Grant rings. Also Greenman-Casale Spl. No. 41.

All cars used Mobiloil (BB) and Mobil Racing fuel except:
No. 1 D-A Lubricant Spl.—using D-A Lubricant and fuel of own choice.
No. 12 Bardahl Spl. using Bardahl lubrication and fuel of own choice.

Tire Sizes: Average size used—7.60 x 16 on front; 8.00 x 16 on rear. A few cars used 8.00 x 16 on rear. Tire pressure this year—60 lbs. (Pressure formerly was 40 lbs. Increase made to improve car handling on resurfaced portions of track.)

Above data obtained by personal inquiries as of 5/29. (Records of USAC Technical Committee not available when this table was compiled.)

Many New Uses For

PLASTICS IN PASSENGER CARS

By Thomas Mac New

Illustration at right indicates typical plastic parts which are being used or can be used in passenger cars

IT is conservatively estimated that the 1956 composite car utilizes 15¼ lb of plastic material as compared to 10.4 lb of plastics which AUTOMOTIVE INDUSTRIES estimated were used in the average passenger automobile just a few years ago. During the course of those few years some plastic materials declined in usage, but others have been developed to replace them and in some cases exceed them in total poundage consumed.

One of the processes which has enabled the automobile industry to take advantage of more plastic material is the premix molding of reinforced polyesters. This is being used for components in many passenger cars currently in production. Formed sheet materials have been developed to a point of general acceptance by the trade; the usage of vinyls has more than doubled in recent years; more applications have been found for nylon; and there is more glass area, thereby requiring more polyvinyl butyral. These items are just typical of the trend in the style conscious yet engineeringly sound automobile industry.

BODIES AND COMPONENTS

The Chevrolet Corvette program is still the largest and perhaps the most impressive application of glass-fiber reinforced polyester resin in the passenger car field. Largest usage, in addition to Chevrolet, can be attributed to Ford production for both the Thunderbird hardtop and the Country Squire station-wagon wood-grained body moldings. Cadillac is using the material as a cover over the Eldorado convertible top when it is folded back into the boot.

ELECTRICAL SYSTEM

ACRYLIC
Dust Proof Lenses & Dials
Exterior Lenses

ACETATE & BUTYRATE
Control Knobs
Radio Grilles
Dial Pointers

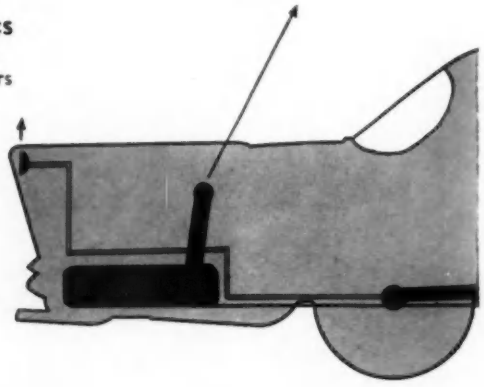
VINYLS
Components

PHENOLICS
Insulation
Connectors

FUEL SYSTEM

PHENOLICS
Carburetor Parts

NYLON
Carburetor Vacuum
Check Valve
Fuel Pump Valve
Carburetor Needle Valve
Complete Carburetor Body



NYLON
Fuse Holder
Dome Light Lens
Sealed Beam Unit Lock Nut
Lamp Socket Bushing
Solenoid Insulator
Generator Insulator
Fuse Block Cover
Directional Switch
Starter Motor Insulator
Distributor Wire Clip
Automatic Starter Switch
Rotor for Headlight Foot Dimmer
Tail Lamp Connector
Horn Ring Insulator
Motor Commutator End Plate
Ignition Sleeve
Distributor Plate Separator
Distributor Cable Holder Retainer Rings
Coil Forms

ACRYLIC
Fender Guide Light
Decorative Medallions
Hood Ornaments
Paint

ACETATE & BUTYRATE
Moldings and Escutcheons
Handles and Knobs
Steering Wheels
Arm Rests
Buttons

COPOLYMERS
Wheel House Covers
Seat Backs
Seat Side Panels
Crash Panels
Headlining
Pillar Covers

Of course, all of the passenger car manufacturers make extensive use of the material for the so-called dream cars. At least one major producer, however, is experimenting with glass-fiber reinforced poly-

TRANSMISSION

PHENOLICS
Clutch Discs

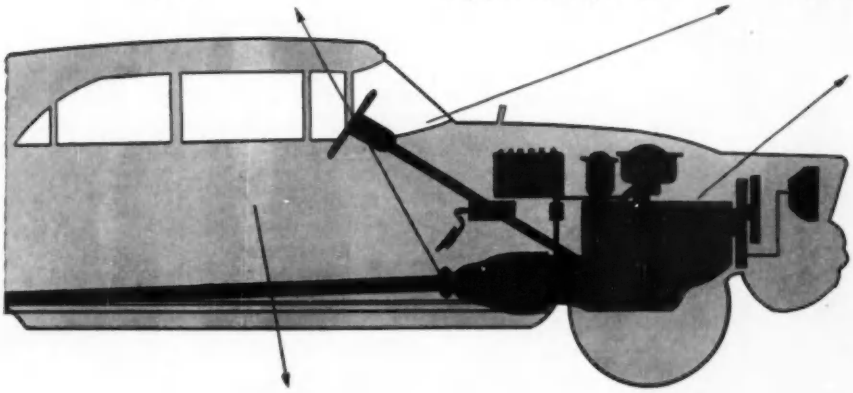
NYLON
Clutch Cross Shaft Bearing
Speedometer Take-Off Gear
Speedometer Worm Gear
Speedometer Cable Sheath
Automatic Transmission Governor Gear

TEFLON
Clutch Cross Shaft Support Bearing Seals

ACCESSORIES

NYLON
Windshield Wiper Gear (Electric)
Windshield Wiper Valve (Vacuum Type)
Purse Hanger
Lubrication System
Windshield Washer T-Connector

POLYESTER
Heater and Air Conditioning Housings



ENGINE

PHENOLICS
Water Pumps
Radiator Strainers

NYLON
Rocker Arm Cover Seal
Line Connector
Spark Plug Gasket
Oil Pan Drain Plug Gasket
Water Pump Connector
Throttle Shaft Bearing
Crankshaft Thrust Bearings
Camshaft Bearings
Oil Pump Gears

BODY

REINFORCED PLASTICS
Station Wagon Trim
Car Bodies
Car Tops
Seat Frames
Instrument Panel
Convertible Top Cover
Fender Fins
Window Frames

VINYLS
Upholstery
Scuff Pads
Socket Seals
Flexible Glazing
Door Panels
Arm Rest Padding
Water Proofing
Door Bumpers
Gaskets
Glass Seals
Mirror Backing
Instrument Panel Covering
Headlining
Sun Visors

POLYVINYL BUTYRAL
Safety Glass Interlayer

PHENOLICS
Water Proofing
Plated Parts

NYLON
Door Hinge Bushing
Window Roller Washer
Door Striker Wedge
Front Seat Back Stops
Bearing & Bushing for Convertible Top Mechanism
Radio Aerial Actuating Cable and Gear
Window Regulating Gear
Convertible Top Actuating Cable Jacket
Bushings and Washers
Power Seat Regulator Gear
Upholstery
Carpet

MYLAR
Metalized Parts for Decorative Purposes
Upholstery Welting

POLYETHYLENE
Seat Cover Film

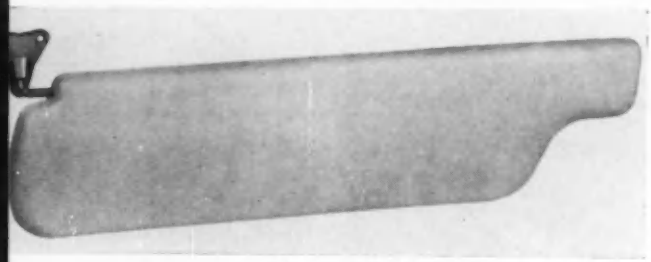
RUNNING GEAR

VINYLS
Valve Caps

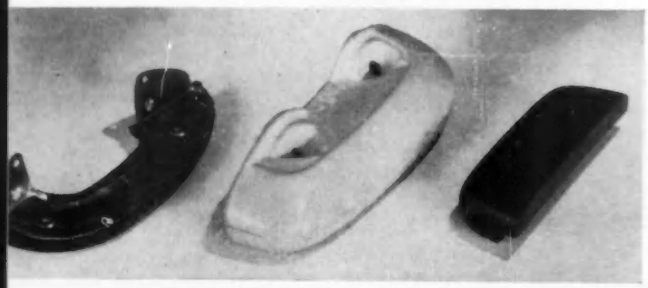
PHENOLICS
Brake Linings

NYLON
Tire Valve Cap
Brake Pedal Bushing
Master Brake Cylinder Push Rod Bushing
Shock Absorber Piston Ring
Shock Absorber Guide Ring
Air Brake Poppet Valve
Steering Column Bushing
Spring Inserts
Ball Seats

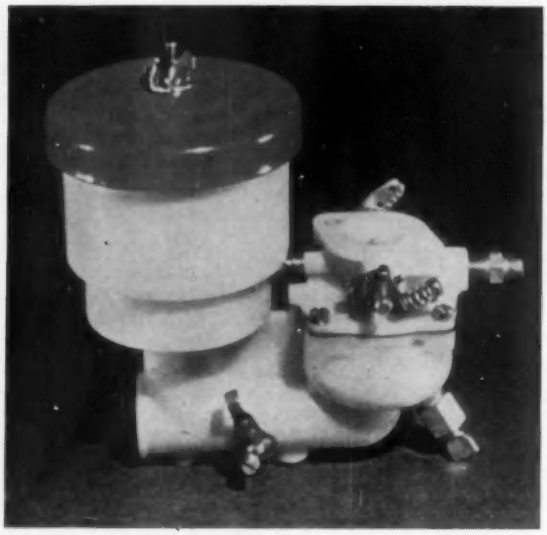
ester conventional style passenger cars which are exact replicas of the 1956 metal production models. This is strictly a research venture, and the company is not releasing any data obtained thus far in the program. The plastic car is, of course, somewhat lighter and quieter because of the inherent properties of the material. Studebaker is using reinforced plastic for its tail fins on the station wagon models and



Vinylfoam molded around visor insert, covered with heat sealed vinyl film surface material, on 1956 Ford padded sun visor.



Arm rests made with a vinyl foam with a slush mounted integral skin and molded-in mounting plate.



Complete carburetor body molded of nylon. This is strictly an experimental application but is being given some impetus to replace die cast carburetor bodies.

Over eight pounds of material goes into a premixed molded heater housing and duct.

for instrument panels and tail fins on its sports cars.

Producers of polyester resins include Bakelite, Celanese, American Cyanamid, Atlas Powder, General Electric, Glidden, Pittsburgh Plate Glass, Plaskon, Reichhold, Rohm & Haas, Schenectady Varnish, and U. S. Rubber.

Now with premix molding utilizing polyester resin and glass, sisal, or a combination of both, the polyester resin market has been given more impetus in automotive circles. Premix moldings are being used quite extensively by Chrysler and some other makers for heater and air conditioning housings and ducts. An application of this type requires a minimum of eight pounds of material per vehicle with air conditioning applications running somewhat lighter. The Continental Mark II uses a premix molding for the door arm-rest panel which weighs slightly more than nine pounds. Premixes have proved to be a very inexpensive method for overcoming certain design problems for parts which do not require the structural strength of liquid polyester and glass cloth.

Nylon, marketed by du Pont under the tradename Zytel, is finding wider use for many functional body components such as window regulator gears and rollers, bushings, door striker wedges, power seat regulator gear, bearing plates for window crank handles, radio antenna actuating cable, and the actuating cable jacket for convertibles. The material is also utilized for stops in folding seats on two door models. As a textile fiber, nylon is used for 3D upholstery material. A thermoplastic, nylon is resistant to abrasion, corrosion, and flexural fatigue. In addition, it is resilient, dimensionally stable, and has a low coefficient of friction.

The vinyl market has been growing by leaps and bounds for automobile body parts in the past couple of years. Vinyl, a thermoplastic, is chemical, abrasion and water resistant, as well as being able to withstand temperatures up to 130 F. The big market for vinyls has been in the upholstery field, non-glare coverings for instrument panels, and as a headlining material. Interior door panels, wheelhouse covers on station wagons, arm rest covers, glass seals, and scuff pads are some further current uses of the versatile material. Vinyl tape is being used by Ford Motor Co. to back up the rear view mirror to prevent flying particles of glass in the event of a collision. Transparent polyvinyl chloride sheet is being used for rear window glazing in some Chrysler Corp. convertibles. This material is also being used extensively by the aftermarket for transparent seat covers. Another comparatively recent application is the use of vinyl reinforced with fabric for windshield-washer water bags, replacing the former glass jar type.

A form of vinyl—polyvinyl acetal or butyral—has been used throughout the industry as the inner layer of safety glass for many years. Because of the industry's trend to more glazed area, this market has been on the increase. The industry uses approximately 18 million lb of polyvinyl acetal or butyral and plasticizer per year just for safety glass. Com-

panies producing vinyl materials for automotive use include Bakelite, du Pont, Dow, General Aniline, Goodrich, Firestone, Nixon Nitration, Monsanto, Goodyear, and U. S. Rubber.

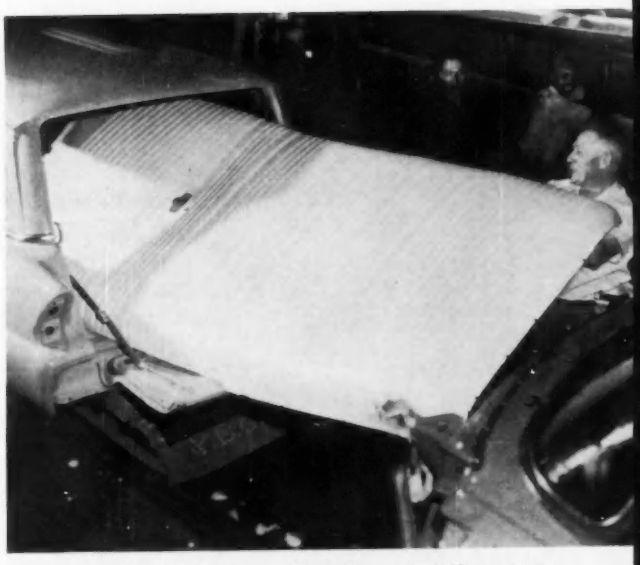
Acrylic, noted for its optical clarity, weather resistance, and color stability, enjoys widespread use for decorative trim and ornamentation for body parts. Instrument panel lenses and air conditioning ducts and grilles are the only functional body parts being molded of acrylic powder. Acrylic rod is utilized for piping light to various instruments and control knobs. There are two makers—du Pont (Lucite) and Rohm & Haas (Plexiglas)—which supply all of the acrylic. The product is available in a range of transparent, translucent, and opaque colors. In addition, acrylics can be plated by vacuum deposition of metallic particles to resemble chrome. Du Pont has also come out with new lacquers using an acrylic base.

Cellulosics—acetate and butyrate—are used primarily for interior body components. These materials have a low thermal conductivity and are ideally suited for such items that are frequently handled in cars. The automotive manufacturers use mostly cellulose acetate butyrate for such items as steering wheels, arm rests, knobs, handles, and escutcheons. Chrysler Corp. cars for '56 are using butyrate for push-buttons which control the automatic transmission. The car makers will consume about 6000 tons of the cellulosics this year just for passenger cars. Some of the properties which make the material so useful are the wide color range, good interior stability, adequate strength, and ease in fabrication.

The copolymers are just beginning to enjoy real success in the automobile industry. Plymouth is using an entire headlining of styrene-butadiene sheet for its station wagons. Several makers are using the material for pillar-post covers on four-door hardtop models. American Motors uses copolymer sheeting for a crash pad cover on instrument panels. Both GM and Packard make seat side shields from sheet stock. Other applications, which are highly feasible, are door panels, wheelhouse covers, trunk linings, and seat backs. One of the major advantages of copolymer sheet is the ease of fabrication. In addition, it has low thermal conductivity, is abrasion resistant, and can be readily bonded to other materials.

Plastic foams—polyvinyl chloride and urethane—have really taken hold in the passenger car field this year with all the emphasis on safety. Most noteworthy use is the instrument panel application where the energy absorption qualities of the material are exploited. Ford also specifies the material for sun visors and arm rest padding. Monsanto's plastic experimental body uses the material as an inner layer between the roof and headlining. If costs can be met, this seems to be a very advantageous utilization as a safety consideration. Foam materials are readily formed and can be sealed to an external covering by electric heating. They are also resistant to many chemicals, to mildew, and to fire. The market for plastic foams should be one to watch since it is expected to grow considerably over the next few years.

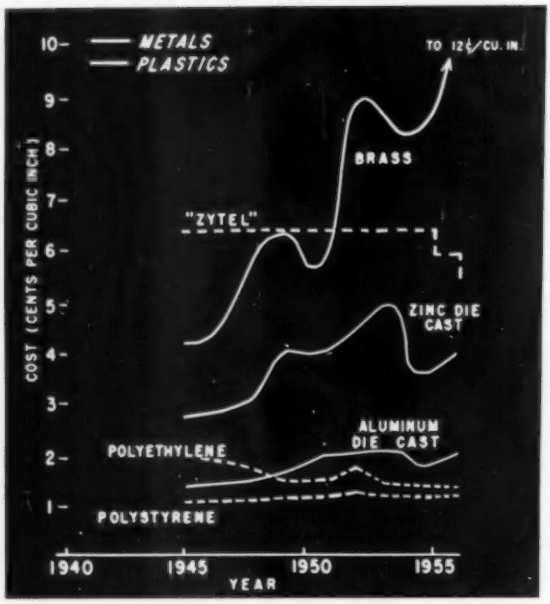
One of the limited production items for which polyester glass reinforced has become so famous. This particular application is for rural mail delivery.



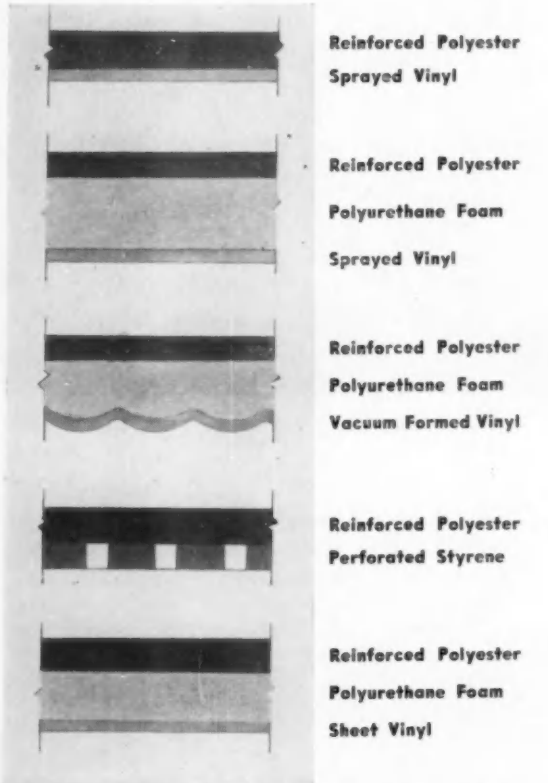
Copolymer sheet is being used for Plymouth station wagon headlining.

Mylar is another relatively recent material which has caught on in the industry. A polyester film, du Pont's Mylar has a high scuff resistance and durability. The material, at present, is used basically for interior trim applications by Studebaker-Packard and Chrysler Corp. Fabrication consists of metallizing Mylar on one surface and bonding it to a heavier material such as vinyl sheet.

Polyethylene made in transparent film has been used for the past two years as a throw-away seat cover on new cars. Hypalon, chlorosulfonated polyethylene made by du Pont, can be used as a coating



Cost trends of the last decade, plastics vs. metals. Source, E. I. duPont de Nemours & Co., Inc.



Interior finishes and acoustical barriers for automobile roofs as proposed by Monsanto.

for sponge weather stripping, window channels, arm rest pads, door scuff pads, and CV strips. It is scuff resistant, non-oxidizing, and very flexible.

Phenolic—a thermoset—is used as a binder in impregnated glass fiber bats used for insulation under-the-hood, doors, body panels, and roof panels.

ENGINE, FUEL SYSTEM, AND COOLING SYSTEM

The phenolics, which are immune to most everything, are utilized for timing gears in six-cylinder engines. For this application, a filler material is used with the resin. Water pump impellers molded of the thermosetting compound are dimensionally stable and are not affected by anti-freeze solutions. In the carburetor, phenolic is used for automatic choke housings and varied small parts. It will also be widely used with fuel injection if and when that system becomes standard passenger car engine equipment.

Although not much by weight, nylon has a host of under-the-hood applications. One of the most noteworthy experimental uses is for a complete carburetor body. Current production utilizes nylon for spark plug gaskets, oil pan drain plug gaskets, water pump connector, carburetor vacuum check valve, fuel pump valves, carburetor valve seats, camshaft bearings, and crankshaft thrust bearings. Nylon can also be utilized for fuel lines, oil pump gear, fuel pump bearings, timing gears, timing belt pulley, and various die cast parts. One company is working on a restarter mechanism using a nylon diaphragm body and plunger. This would be for cars equipped with an automatic transmission.

Teflon, another du Pont product, is currently being used for some grease seals and there is a possibility that the material will go into hydraulic valve lifters as an oil seal. This product is desirable where higher resistance and low coefficient of friction are required.

RUNNING GEAR AND TRANSMISSION

One recent large application of plastics in the running gear of Mercury and Lincoln cars is for the multilub system for automatic lubrication of moving parts. Nylon tubing is used to carry the grease to various chassis components. This same material is used by the industry for speedometer gears, bushings for the steering column, automatic transmission governor gears, spring inserts, valve caps, ball bearing retainers and grease seals, shock absorber seal ring and guide ring, clutch shaft bearings, and sheaths for springs and cables. Not too long ago, nylon was in the testing stage for many of the applications just mentioned. There is still some thought being given to the use of nylon for such parts as automatic transmission valve bodies and power steering components. Some makers will probably use the plastic for bearings on ball joints in suspension systems.

Major use of phenolics in this category is for bonding brake linings. Approximately 25 per cent by

weight of the linings is made up of the resin. In this application, the product has to take operating temperatures up to 700 F. Phenolic is also used for clutch disks in manually-shifted cars. When combined with rubber, the phenolics are used as oil seals for gear and steering assemblies.

About the only application of polyethylene is for leaf spring liners. Properties of this material tend to reduce spring noise.

Teflon is being made into clutch cross shaft support bearings by one automobile manufacturer. Due to its high resistance to temperature change, −320 F to +550 F, it has been highly acceptable for automatic transmission oil seals.

Vinyl has found some use as tire valve caps molded in various shapes.

ELECTRICAL SYSTEM

Glamor material of the electrical system is acrylic. Molded easily in various shapes and sizes, the material has been well accepted as the tail-light standard. Each year, the tail lights become larger and larger and in more complex shapes. Entering a little levity, William C. Wall of du Pont's Polychemicals Dept., when he plotted the net weight of typical tail light assemblies against gross automobile weight for the past 10 years and extrapolated out to 1975, came up with a car where the tail light was about one-half the total area and one-third the total weight. This just points out how the market for acrylics has been growing for tail light assemblies.

In addition to tail lights, acrylics are used in the electrical system for parking light, license plate light, directional signal light, and back-up light lenses. Instrument lenses are made of the material, and it is used for edgelighting and for piping light.

Phenolics also are among the major plastics in the electrical system. Distributor caps and rotors are perhaps the largest and best known part made of the thermosetting resin. For all ignition parts including those mentioned above, approximately 8 million pounds of phenolics are used per year by the industry, according to Warren A. Sharp of Monsanto. Because of its properties—electrically non-conductive, chemically inert, resistance to heat, and low cost—phenolic compounds are used for a large variety of switches, terminal blocks, connectors, instrument mounting frames, housings, commutators, and solenoid rings. Some of the parts are made of rubber-based phenolic compounds.

WEIGHT COMPARISON OF PLASTICS
In A Composite Car

	1956
Acetate and Butyrate	1.60
Acrylic	1.40
Nylon	0.25
Phenolics	2.20
Polyvinyl Butyral or Acetal	2.20
Vinyl—extended and molded	3.35
Others, Polyester, Copolymers, etc.	4.25
Total	15.25

Dome light lenses are the biggest current market for nylon, but the material is also utilized for coil forms, fuse holders, retainer rings, insulators for horn rings, insulators for solenoids and generators, locknuts, accessory motors, and voltage regulator bases.

Vinyls are used as a harness tape, wire covering, spark plug boots, distributor boots, and a variety of insulators.

MISCELLANEOUS PARTS

Nylon is in service as a gear for actuating remote-controlled radio antennas. The part is reinforced with glass, molded as a gear blank, and then cut to specifications. Nylon is also used for the shaft of remote controlled antennas. Another interesting application is the power seat regulator gears molded of nylon by Ford Motor Co. Delco uses nylon in various assemblies for its car radios. A nylon bushing is used in some turn signal indicator devices.

One development which will bear watching is reinforced polyester in the form of entirely new seating. The whole program is currently being kept under wraps, but there is an intensive research project underway.

• • •

GM Issues New Catalog With Variety of Films

General Motors has compiled a new catalog listing 57 films which are available free for use by schools, churches and business and social groups. The films cover a variety of subjects ranging from "The ABC's of the Automobile Engine" to such general topics as "Farmers of Tomorrow."

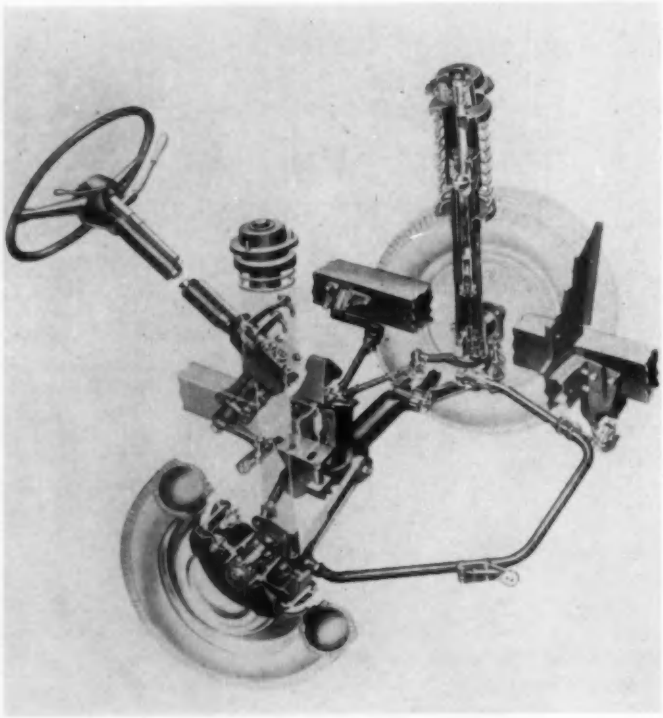
Chrysler of Canada Ships Some Cars by Lake Vessel

Chrysler Corp. of Canada, Ltd., has arranged to transport some automobiles by freighter from Windsor, Ont., to Fort William at the western end of Lake Superior. The company reportedly will save from $32 to $45 on shipments of cars to various parts of western Canada under the plan.

Willys Forge Div. Expands Its Commercial Operations

Realignment of equipment and production schedules has enabled Willys to expand its commercial forge drop business considerably, and diversify its sales. The forge division makes tank treads, aircraft fittings, steering knuckles, gears and crankshafts. It has a $1 million backlog in orders.

Improved Suspension for British Fords



THE new range of British Fords of integral body-frame construction incorporates a light-weight and simple front suspension unit which is a further improvement on the design developed several years ago for the Consul, Zephyr and Zodiac. Consisting of a telescopic shock absorber surrounded by a coil spring, its upper end is free to rotate in a thrust bearing which is anchored in rubber to a cup bolted to the reinforced fender apron.

The steering knuckle forging is on the lower tubular portion housing the shock absorber cylinder and associated compression and rebound valves. It is positioned by a ball joint on the single track control arm, which in turn is linked by a ball joint to the stabilizer bar. The piston rod is attached to the upper spring seat and shrouded by a cylindrical member.

Unsprung weight is minimized by the design of the brake drums, which consist of an iron drum cast integrally with a pressed steel disk. The joint is strengthened by small tongues along the circumference of the disk. Front brakes with two leading shoes have been widened to 2¼ in.

Longer springs have been introduced at the rear, and the axle is now bolted ahead of their centers. Rubber bumpers are also placed further forward to give more progressive reduction of spring rate under high deflections.

• • •

Experimental Car Interior Shows Many Plastics Uses

An experimental automobile interior utilizing plastics in several novel applications has been designed and built by four students at Pratt Institute in Brooklyn, N. Y. Planned and executed in Pratt's industrial design laboratory, the program was sponsored by Monsanto Chemical Co.

Probably the most significant expanded use of plastics in the model is its seating. The bucket (bottom and back) of the seat is molded in one piece of reinforced polyester to eliminate a need for complicated assembly technique. It is upholstered with urethane foam and coated with sprayed-on vinyl.

The door liner, another one-piece unit which slides quickly into place and fastens easily, is made of high-impact styrene. It can be made in a variety of colors and finishes with either sprayed or laminated vinyl.

The molded-in arm rests are cushioned with resilient urethane foam. As a headliner, the students used styrene molded in one piece and designed to snap into place. Polyester, vinyl or styrene padded with urethane foam for safety is suggested for the one-piece instrument panel.

Other features in the model include: flexible, roll-out plastic map; one-piece styrene, behind-the-seat deck shelf; and a vinyl floor covering which can be sprayed on or laminated to the steel body of the car.

SPI Plastics Div. Elects Clare E. Bacon Chairman

Recently named chairman of the Reinforced Plastics Div. of The Society of the Plastics Industry, Inc., was Clare E. Bacon. He is manager of custom modeled sales of Owens-Corning Fiberglas Corp.

The Reinforced Plastics branch of the plastics industry consists of approximately 175 companies throughout the U. S. It produces products made up of various kinds of reinforcements, resins, catalysts, inhibitors, colorants and fillers.

The Reinforced Plastics Industry experienced substantial expansion in the last year and a half, and showed an 80 per cent increase in business in 1955 over the previous year.

Gasoline-Engine Starter for Diesel Engines

It is a well-known fact that Diesel engines require considerably more power for starting than gasoline engines of comparable output or displacement. Starting difficulties increase with a drop in the temperature of the atmosphere, and in sub-zero temperatures it is almost impossible to start Diesel engines. While a number of different starting systems are in use, in the United States electric starters similar to those used for automobile engines predominate. But both the starter motors and the batteries must be relatively large if reliable starting under difficult conditions is to be ensured. Cranking of the engine for some time improves the starting conditions, as the shear resistance of the oil films is decreased and the cylinder-wall temperature raised, but low temperatures decrease the battery capacity, and the battery may become exhausted before the engine picks up its cycle.

What seems to be a new method of starting Diesel engines has been developed in Germany jointly by ILO, a manufacturer of small bicycle and industrial gasoline engines, and the Robert Bosch Company of Stuttgart. The gasoline engine used, which is of the two-stroke type, is being manufactured in three sizes, of 6, 12, and 24-hp rating, the first two being single-cylinder designs, the last one a two-cylinder. The largest engine is said to be able to start high-speed Diesel engines of up to 1000 hp.

A diagram of the starting equipment is shown in Fig. 1. Ordinarily the starter engine is started by hand, but the larger size can be started electrically, if desired. The starter drives the Diesel engine through a friction clutch, a pair of spur gears, an overload coupling, and the usual starter gears. A lever moves the pinion axially to engage the starter gears. The starter engine also drives a water brake or centrifugal pump, which is connected in circuit with the cooling systems of both engines. When the starter engine is started, it drives only the water brake, which is so designed that it takes the full output of the engine at the engine's maximum intended speed. Consequently, the water brake serves also as a speed governor for the starter engine. The output of the starter engine is converted into heat in the water brake, and this heat is transferred to the cooling jackets of the two

(*Turn to page* 106, *please*)

FIG. 1

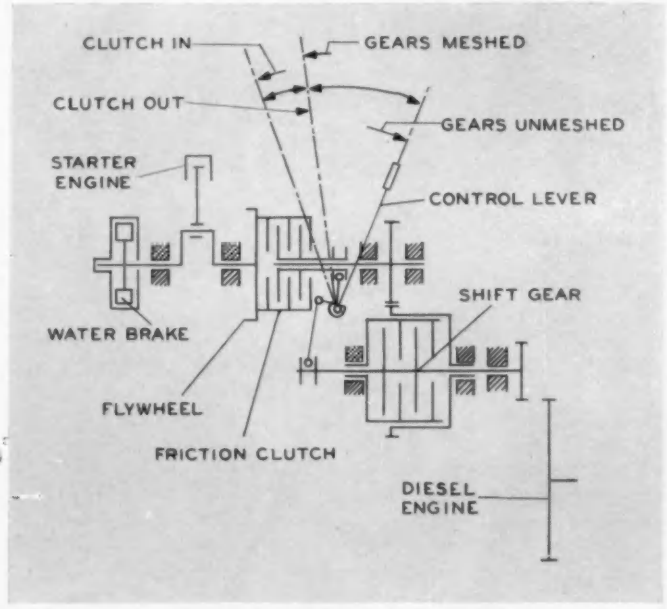
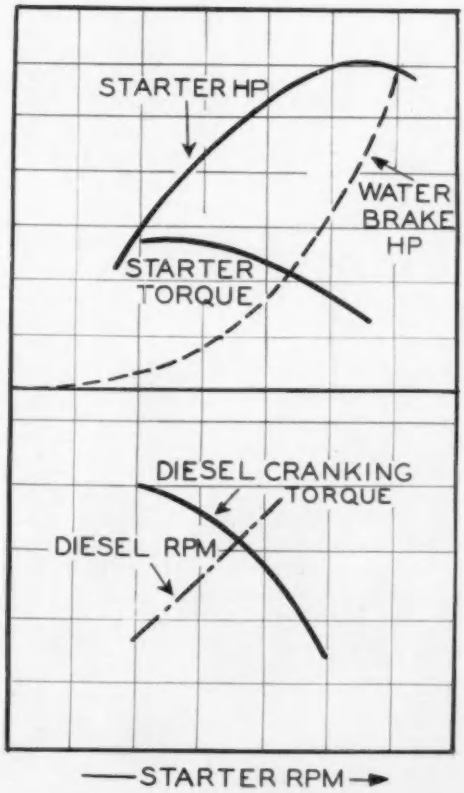
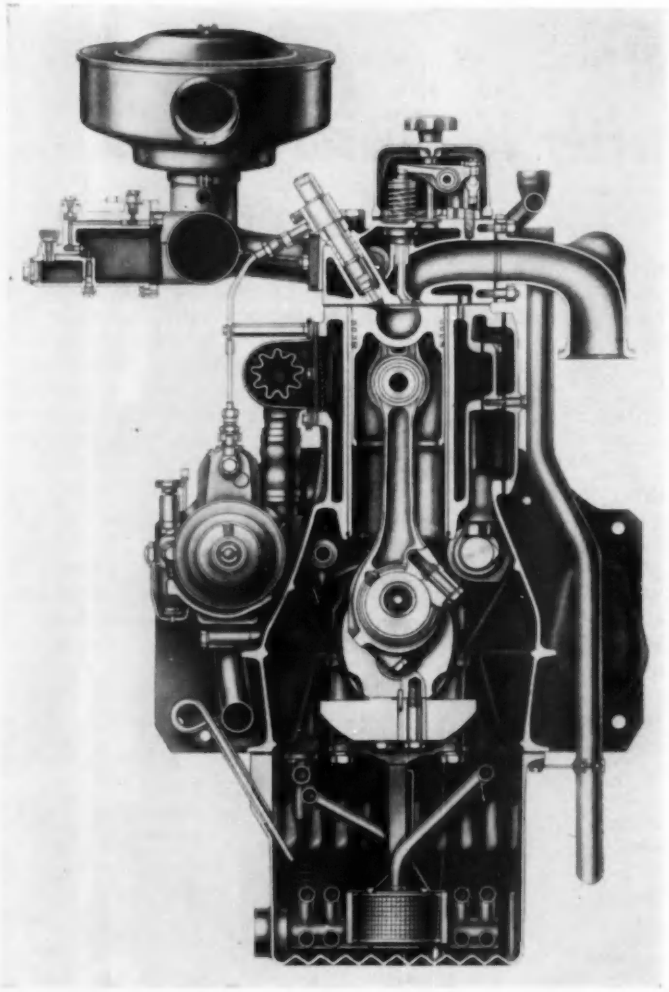


Diagram of starter-engine installation

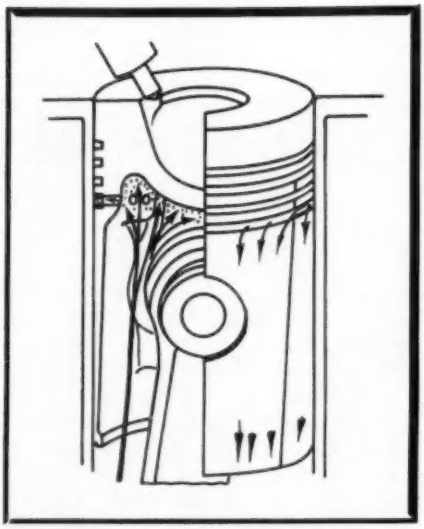
FIG. 2



Variation of various operating factors with starter-engine speed



Cross-section of the MAN engine incorporating the revolutionary combustion principle.



Oil cooling of piston insures lukewarm combustion chamber to prevent fuel cracking.

A New Concept of

By
P. H. Schweitzer

FROM the time the Diesel engine was invented, thought was always concentrated on mixture formation. It can also be truly said that the improvement in mixture formation was paralleled with Diesel engine progress. Early slow-speed Diesel engines used air injection first and a multiplicity of nozzle orifices later when solid injection was adopted. The high-speed Diesel engine became a success with the introduction of the precombustion chamber by L'Orange in which the initial combustion of a small amount of the fuel helped to disperse the rest. This was followed by the swirl chamber engine of Ricardo, and the air-cell engine of Lang. In every case artificial means were used to disperse more uniformly the fuel which was already finely atomized by a high-pressure injection nozzle. Auxiliary chambers were accepted as a necessity although they had higher fuel consumption because of their higher heat loss and "pumping" loss.

The high-speed direct injection open chamber engines could not make the grade until the invention of the swirl and squish. A violent air motion was needed to disperse the fuel uniformly in order to prevent the mixture from being overrich at one spot and overlean at another spot during combustion. Did we need anything more to be convinced that perfect distribution makes a perfect Diesel engine?

True, the engines with the best atomization and dispersion still knocked and smoked. This was attributed to the circumstance that the atomization and dispersion was still not good enough. In order to refute this theory, Dr. S. Meurer of MAN Co. in Germany built an engine where distribution as photographed was almost perfect. This engine with the best mixture knocked and smoked more than the others.

When Dr. Meurer made this experiment he already knew that the accepted theory of combustion is false. Concentrating on the physics of the mixture formation, engineers ignored the chemistry of the combustion.

Diesel Combustion

Combustion was regarded merely as an oxidation process. In the process the hydrogen of the hydrocarbon molecule burns to H_2O and the carbon to CO_2 perhaps after some intermediary stages. What actually happens is quite different. Combustion reaction is accompanied all along with pyrolysis or cracking of the molecules. Cracking of the hydrocarbon takes place in the absence as well as in the presence of oxygen.

An early product of this cracking is hydrogen which burns explosively with knock. The end-product is often pure carbon which is a slow burner and some of it appears as soot. Hence exhaust smoke. No mechanical process of mixture formation can prevent this sequence. Judged from Meurer's discovery, Diesel engineers were all along on the wrong track.

COMBUSTION THEORY

This combustion theory, by which carbon is formed during the combustion of hydrocarbons, is less new to chemists than it is to engineers. There is no point to going into the retails of various theories because their common denominator is sufficient for the purpose (2).

When hydrocarbon burns, two chemical processes are taking place side by side; oxidation on one hand and pyrolysis or thermal decomposition, commonly called cracking, on the other hand. When exposed to high temperature and pressure, the molecules break into atoms. The ease with which molecues break is indicated by their bond strength. It takes 80 kilocalories per mole to split a single-strength carbon molecule, 150 kilocal/mole for a double-strength carbon molecule, and 200 kilocal/mole for a triple-strength carbon molecule (C-C)=80, (C-C)=150, (C-C)=200. But to split a carbon-hydrogen molecule takes only 100 kilocal/mole (C-H)=100. So hydrogen atoms will split off and may oxidize before double-strength carbon atoms crack. When heavy carbon atoms crack their oxidation is delayed by circumstances that will appear later.

Cracking is taking place with or without the presence of oxygen. In the latter case oxidation reactions compete and interact at every step with thermal decomposition. Thermal decomposition is promoted by high pressures and temperatures. However, even at low-temperature oxidation of hydrocarbons, decomposition predominates over polymerization, unless the primary products isolated are lower hydrocarbons, aldehydes, alcohols, ethers, peroxides, etc. (3). Formaldehyde and methyl alcohol decompose mainly to CO and H_2, consequently no carbon appears in their flame and they cannot be made to smoke. All other hydrocarbons develop carbon at least at an intermediate stage of the combustion process and in some cases part of the decomposition reactions proceed to this phase *before* any oxidation takes place.

However, what kind of flame develops after the early cracking of the hydrocarbon depends largely on amount and distribution of the oxidant present.

The flame of a wick lamp or a candle is typical of what is called a diffusion flame. The oxygen gets to the reacting hydrocarbon molecules from the outside and through diffusion only, a rather slow process.

In the presence of a normal amount of air, the kerosene in a wick lamp burns without smoke. But does this mean that the combustion is an oxidation process purely? If it were, the flame of the lamp would be pale blue instead of bright yellow. It is the glowing carbon particles which give the flame its yellow brilliance, and the incandescent carbon particles are of a *solid state*. These particles are small but much larger than a molecule. In certain diffusion flames decomposition to carbon is complete before the oxygen zone is reached (4).

The "premixed" flames, like a Bunsen burner, are of different nature. If the gas-air mixture contains sufficient oxygen after ignition for complete combustion, oxidation processes probably predominate over those of pyrolysis, but C_2 bands still appear in the emission (5).

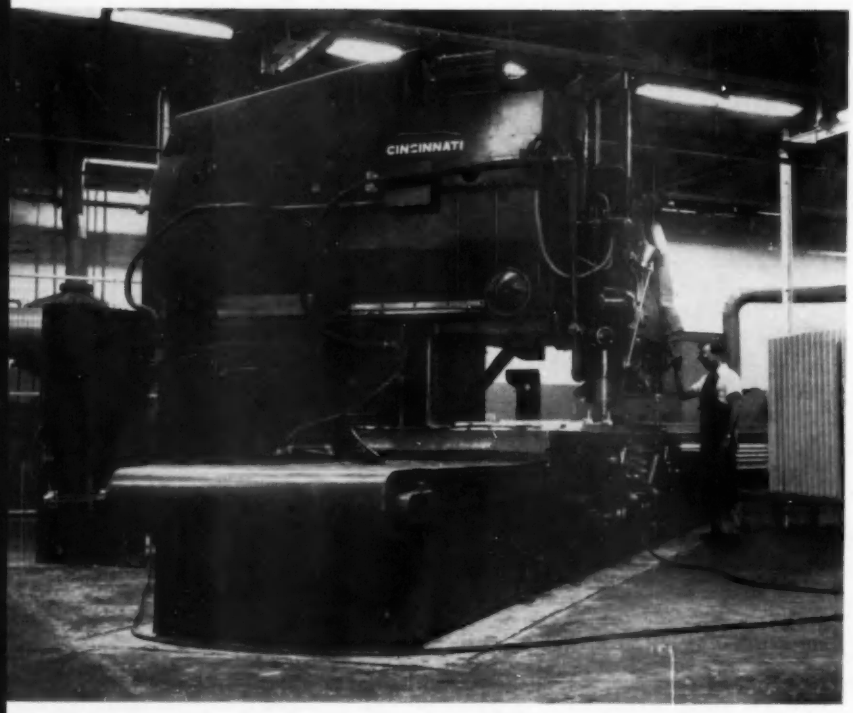
In premixed flames of a wide range of hydrocarbons uniformly mixed with air, the *carbon forming* point is at mixture ratios of 130 to 140 per cent stoichiometric (rich) (6), and the smoking point is still higher. This indicates that in gaseous combustion of a slightly rich mixture the excess carbon oxidizes to CO and no carbon appears in the flame. In somewhat richer mixtures carbon does form but is consumed by the flame before any part of it is released as smoke. A further enrichment of the premixed flame causes smoke to appear, but the mixture ratio then usually exceeds 160 per cent (6).

The flame in a carburetor engine is somewhat like a premixed flame, while in the Diesel engine it is more like a diffusion flame. True, the fuel it atomized but the drop size is of the order of 50 microns and contains some 10^{14} molecules. Only a small portion of these molecules are on the surface of the droplets, the rest depend upon evaporation and diffusion for access to oxygen. Diffusion is a relatively slow process while thermal decomposition accelerates at an exponential rate. So oxidation is unable to keep pace with the thermal decomposition which leads to formation of

(*Turn to page* 132, *please*)

REFERENCES

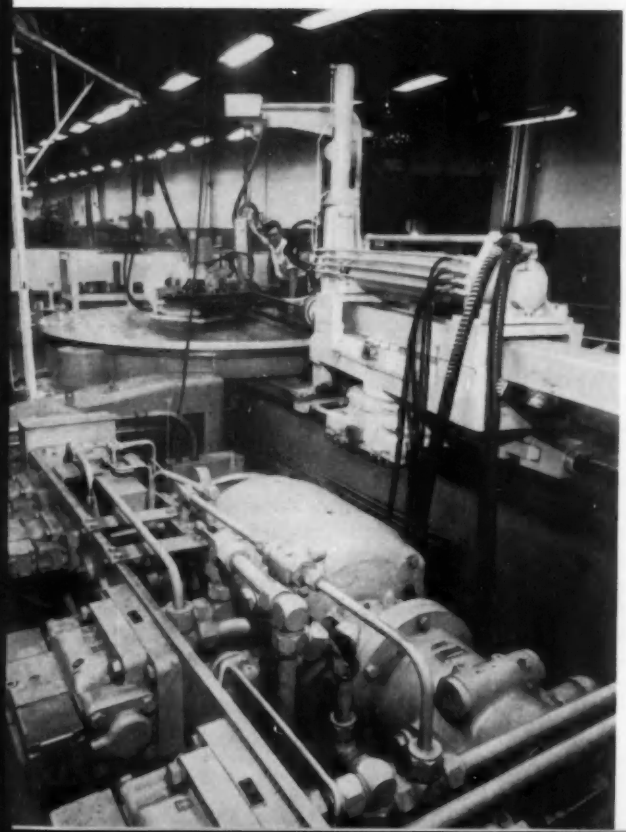
(1) J. S. MEURER: *Evaluation of Reaction Kinetics Eliminates Diesel Knock, The M Combustion System of MAN*, SAE paper No. 535, June 12-17, 1955.
(2) A. G. GAYDON and H. G. WOLFHARD, *Flames, Their Structure, Radiation and Temperature*, Chapman and Hall, 1953.
(3) B. LEWIS and G. VON ELBE, *Combustion, Flames, and Explosions*, Academic Press, New York, 1951.
(4) W. G. PARKER and H. G. WOLFHARD, *Proc. Phys. Soc.*, Vol. 65, 2, 1952.
(5) A. G. GAYDON, *Spectroscopy and Combustion Theory*, Chapman and Hall, London, 1948.
(6) R. L. SCHALLA, T. P. CLARK, and G. E. MACDONALD, *Formation and Combustion of Smoke in Laminar Flames*, NACA Report 1186, 1954.



One of the largest Cincinnati Hydrotels to be found in the automotive industry, the unit seen here performs intricate profiling and cavity operations on a variety of airframe parts.

Diversified Activities at Temco Aircraft Corp.

Perspective of the 35-ton Cyril Bath radial draw former. Used primarily for forming rolled and extruded sections, it has a 100-in. diameter table. Note the large Vickers hydraulic system in the foreground.



TEMCO Aircraft Corp., with plants in Dallas, Garland, and Greenville, Texas, occupies a unique position in the expanding aircraft industry. Part of this stems from an entirely new concept of subcontracting service to prime producers. Breaking with tradition, Temco is prepared to offer a complete service, encompassing basic airframe component design, tooling, fabrication, and final assembly, thus accepting full responsibility for components from the inception of design to the finished section. This is a distinct departure from the conventional practice of building components to a design provided by the prime contractor.

In addition to manufacturing, the company is carrying on a brisk business in the reconditioning and modifying of military airplanes, reconditioning piston engines, modifying private planes, and a variety of other activities. Early in April Temco unveiled its latest project — a tiny jet trainer equipped with a Continental jet engine. In miniature it possesses all of the complexity of military jet airplanes — instrumentation, removable canopy, ejection pilot seat, etc.

Quality control predominates throughout the operation, extending to the design of massive framing jigs for airframe components, capable of producing such parts to tolerances that were not achieved at the close of the last war.

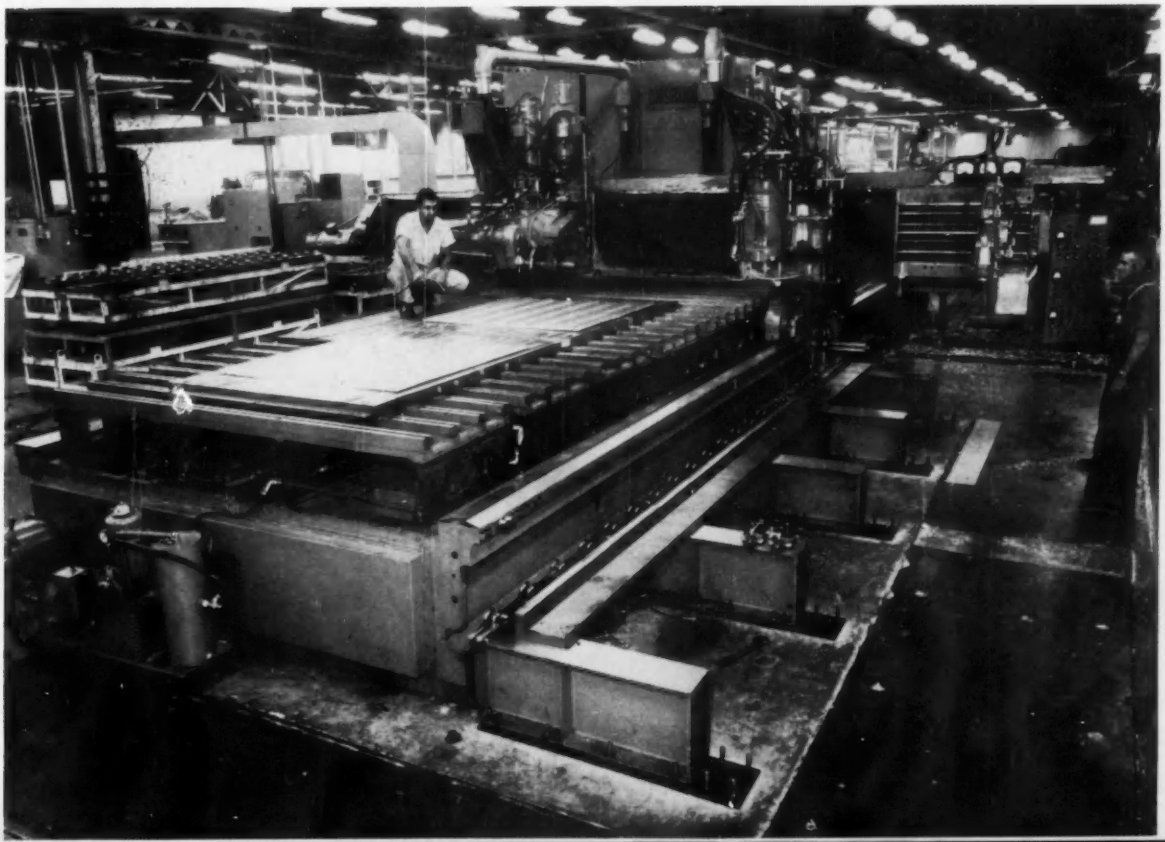
View of the extensive spar mill section in the Temco plant. Installed in this area are six Onsrud spar mills with 60-ft beds.

Fabrication equipment and machine tools are of the latest types available today, including a battery of Lake Erie hydraulic presses in the Dallas plant—some of 3500-ton capacity and one of 5000-ton capacity—also a large Danly mechanical press. Cincinnati Hydrotels of various sizes are employed, including the large unit illustrated on the opposite page.

To take care of the many special requirements of milling, such as spars from thick billets and large skin sections, Temco has an installation of some of the largest Onsrud equipment available for the purpose.

One of the most recent acquisitions is an unusual Cyril Bath radial draw former, used mainly for forming rolled and extruded structural forms.

Latest acquisition is this Onsrud gantry-type skin mill. It has a clear work surface 9 by 30 ft and the bed can be extended by 19½ ft increments. It has GE selsyn controls on the tracing system, providing rise and fall and transverse tracing.



Chrysler Uses Up to 80 Lb of Aluminum per Car

TABLE I

Aluminum Components For Chrysler Corp. Cars

	Sheet Metal	Die Castings	Permanent Mold	Extrusion	Wire	Bar	Total
Pieces	228	58	41	46	32	5	410
Weight Lb	32.853	116.439	138.316	7.010	0.090	0.053	294.761

This table represents the number of different aluminum products—and their total weight—made for the complete line of 1956 Chrysler Corp. automobiles. Table II gives the typical number of parts and total weight for each make in the Chrysler line.

THE increased use of aluminum in cars has led the primary aluminum producers to be very optimistic about the future of the metal in the automobile industry. One producer, Reynolds Metals, predicts that 1957 cars will average about one-third more aluminum than this year's models. Another large producer

TYPICAL ALUMINUM PARTS USED IN CHRYSLER'S 1956 MODELS

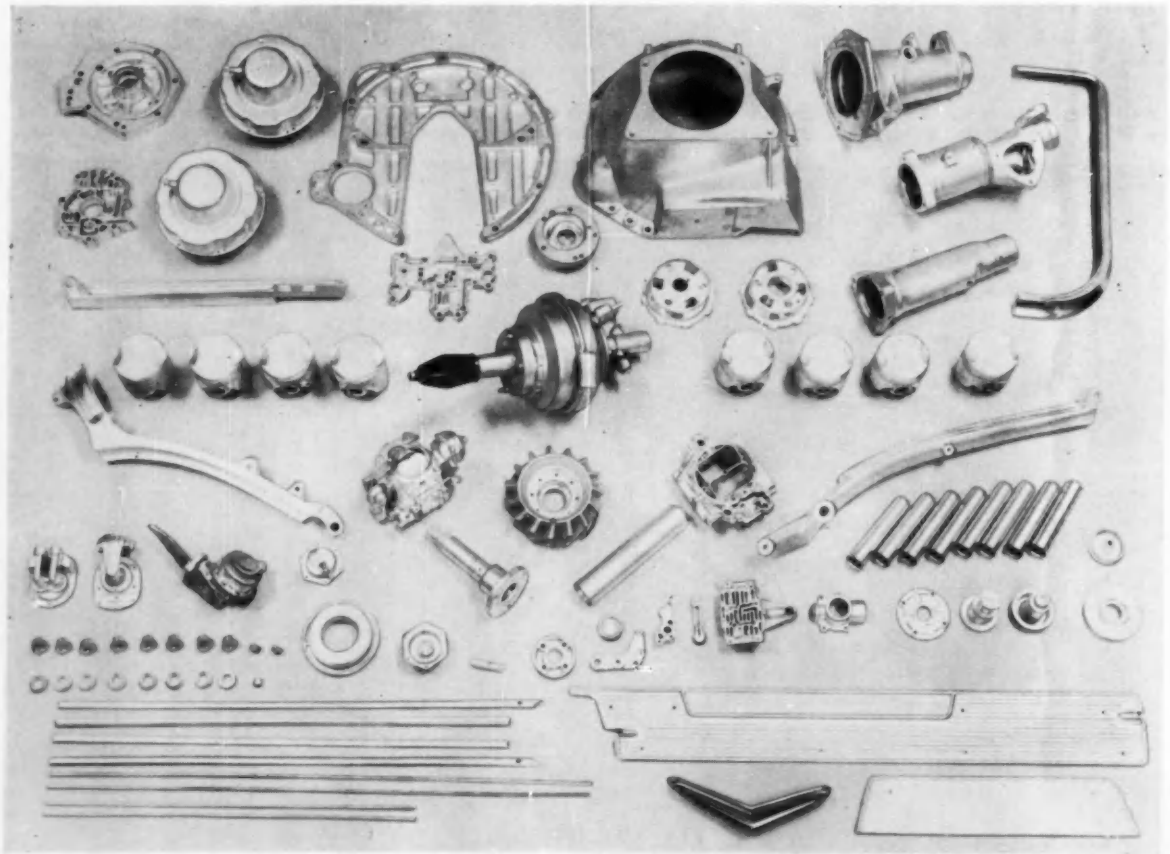


TABLE II

Aluminum Parts and Weight Per Car*

Make	Parts	Weight Lb
Plymouth	127	68.2
Dodge	136	70.3
De Soto	128	73.2
Chrysler	116	76.1
Imperial	121	80.5

* Number of parts and weight is given for cars equipped with power steering and automatic transmission.

Aluminium Co. of Canada, optimistically forecasts that the average will be more than doubled by 1975 and will be slightly more than six times as much in 1980. Currently, 1956 models contain on the average about 33 lb of the metal.

Chrysler Corp. is well above the national average with a weight of close to 70 for Plymouth and slightly more than 80 for the Imperial. Over the years, Chrysler has perhaps used more light metal in its passenger cars than any of the other producers.

TABLE III

Use of Aluminum in Chrysler Automatic Transmission, Power Steering, and Power Brakes

	Part Name	Product	Net Weight
POWER BRAKES	Wheel Cylinder Pistons	Impact Extrusion	.24
	Wheel Cylinder Piston Expanders	Impact Extrusion	.08
	Power Brake Unit	Die Casting	1.79
POWERFLITE	Governor Body	Die Casting	.31
	Throttle Valve Operating Lever	Die Casting	.037
	Rear Oil Pump Housing Oil Hole Plug	Bar Stock	.001
	Direct Clutch Piston	Die Casting	.500
	Kickdown Piston Rod Guide	Die Casting	.125
	Regulator Valve Body	Die Casting	1.180
	Kickdown Piston	Die Casting	.270
	Output Shaft Support	Die Casting	2.860
	Rear Oil Pump Housing	Die Casting	.760
	Output Shaft Support Line Plug	Bar Stock	.010
	Valve Body	Die Casting	.620
	Transfer Plate	Die Casting	.850
	Transmission Extension	Permanent Mold Casting	6.30
	Torque Converter Housing	Die Casting	10.50
	Adapter Plate	Permanent Mold Casting	7.14
	Stator	Die Casting	3.20
	Reverse Servo Piston Sleeve	Impact Extrusion	.15
	Reverse Servo Piston	Die Casting	.25
	Valve Body End Cover	Die Casting	.09
	Gear Gearshift Lever Knob	Die Casting	.067
POWER STEERING	Cover	Impact Extrusion	.05
	Pressure Relief Valve Body	Die Casting	.05
	Head Hyd. St. Gear	Permanent Mold	.43
	Hsg. Hyd. St. Gear	Semi-Permanent Mold	4.50
	Hsg. Hyd. St. Gear Worm	Die Casting	2.70

Back in 1925, the company used just nine pounds in six aluminum pistons; but today, it produces some 410 different parts of aluminum which have a total weight close to 295 lb.

Largest use of aluminum by Chrysler is for automatic transmission parts with engine parts second. There are 35.2 lb in the transmission, 15.9 in the engine, 2.1 lb in the power brake system, and 7.7 lb in the power steering system.

Launching of SUB Presents Host of Problems

Probably no other aspect of a union contract has been as difficult to administer as the Supplemental Unemployment Payment plan, now undergoing its first major test in the automobile industry. To be sure, automobile companies have been making preparations for administering the plan for some time. However, since layoffs have come much faster than originally anticipated, it has been necessary to accelerate the vast machinery for the expected rush for benefits.

Biggest problem industry faces is the tremendous educational job to be done in giving workers both the bad and the good news on how the plan operates. This is further complicated by the fact that there is not enough money built up in the SUB funds to provide full benefits to the growing number of unemployed persons (estimated at more than 150,000), with the result that many workers will find their payments limited.

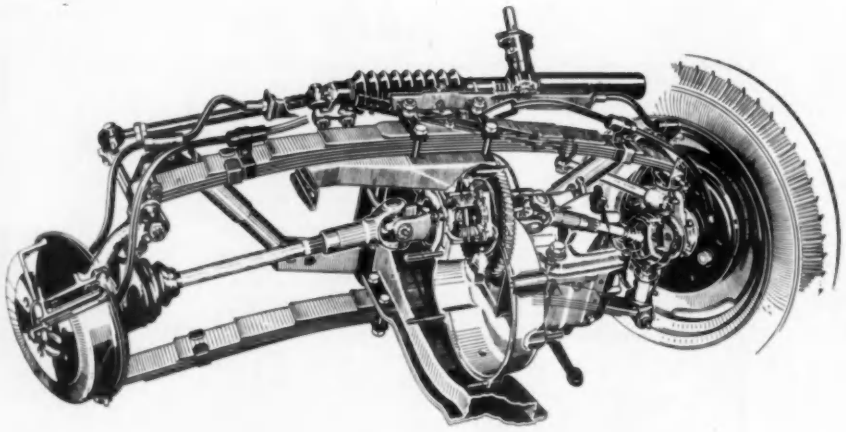
Another factor contributing to the present confusion is determining who is eligible for the benefit payments. Although most workers laid off on or after May 2 are eligible, some of that group will not qualify.

Contracts specify that a worker must have at least one year seniority in addition. Disappointment also is coming to many others who work in plants located in states which have outlawed the SUB plan, such as Ohio and Indiana.

At this stage, it is almost impossible to determine the number of workers laid off who will not be entitled to collect benefits. However, one of the Big Three companies estimates that about 10 per cent of the workers laid off on or after May 2 will not qualify for payments.

Further disappointment will come when many low seniority workers discover they will draw benefits for only a relatively short time because of lack of funds. In order for eligible workers to get their full benefits the SUB fund, to which car companies have been contributing at the rate of five-cents-per-hour-worked by each employe, would have to be built to more than $250 million at the Big Three companies alone. At present, the fund stands at slightly over $60 million, or about one-fourth of its maximum size.

As further layoffs are expected in the coming weeks, some temporary alternative plans for paying benefits may be agreed upon between the car companies and the union. One alternative plan being discussed is to pay workers a maximum of $10 a week for not more than four weeks, instead of the maximum $25 a week for 26 weeks. This, to retard depletion.



Front axle assembly of the Lloyd 600. In this drawing, the engine is removed from the flywheel housing to show the disposition of the gearbox and differential.

New Lloyd Engine Has OVERHEAD CAMSHAFT

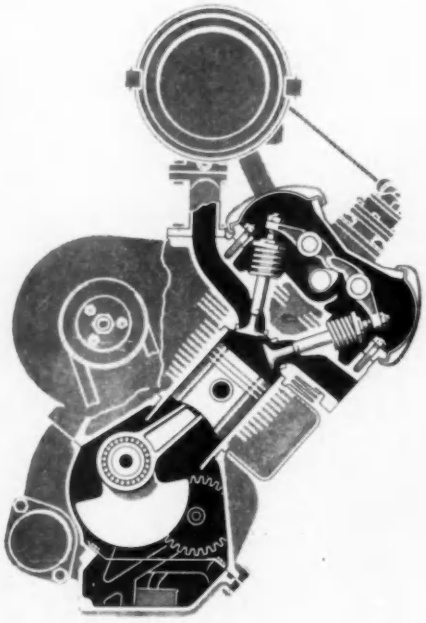
LLOYD Motorenwerks of Bremen, Germany, is now offering a new four-stroke aircooled engine as an option in place of the 24.4 cu in. two-stroke unit for its range of small cars. Also of two cylinders, this has a displacement of 36.4 cu in. and is rated at 19 hp at 4500 rpm.

Despite the higher revolutions, generously over-square design keeps the piston speed down to 1880 fpm at maximum power, which is said to give a road speed of 60 mph. Bore and stroke are 3.03 and 2.52 in., and compression ratio 6.6 to 1.

Inclined valves in the individual aluminum cylinder heads are operated by a common overhead camshaft mounted in a single detachable rocker box which also supports the distributor. The camshaft is splash lubricated, and is chain-driven from the crankshaft.

The oil pan is a rigid aluminum casting embodying a support for the crankshaft center bearing as well as oil galleries for bearing lubrication. Roller bearings are used for the connecting rod lower ends and the crankshaft, the latter being fabricated from five pieces.

Cooling air from the axial blower is ducted past the finned cylinder block. The engine, carried ahead of the transverse leaf springs in front and tilted forward at an angle of 40 deg, is in unit with the three-speed gearbox and differential. Drive to the front wheels is through universal joints and splined couplings.



The overhead camshaft of the Lloyd engine is carried in a single rocker box spanning the two individual cylinder heads.

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Predict 12 Million Families Will Buy Used Car This Year

While sales of new cars this year will fall behind the record level of 1955, a highly optimistic picture is being painted for used car sales. Harold E. Churchill, general manager of Studebaker Div., predicts that 12 million families will purchase used cars this year.

Of the total, nine million will make their purchases from franchised new car dealers, Mr. Churchill estimates. The remainder will be bought from used car dealers.

Although it is difficult to estimate the exact number of used units sold each year because of various complications in transferring registrations and certificates at auctions, Mr. Churchill's forecast is consistent with one made by the National Automobile Dealers Assn. NADA estimates that franchised dealers this year will sell 1.6 used cars for every new unit.

Hence, if current forecasts for sales of 5.8 million new cars this year come true, sales of used units by franchised dealers alone should approximate 9.2 million. The average used car buyer will pay from $800 to $1000 for a car this year, Mr. Churchill estimates.

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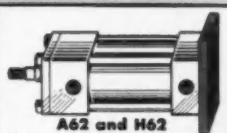
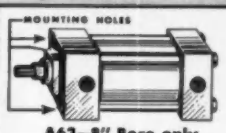
"IN-STOCK" MODELS

"A" Signifies Miller 200 psi Air Cylinders; "H", 2000 psi Hydraulic Cylinders. Interchangeable Mountings Are Shown In Red On Drawings.

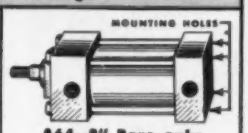
A61 and H61
Flange Mounting on Rod End
(A61 not available in 8" bore)



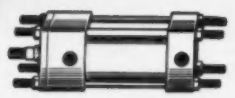
A62 and H62
Flange Mounting on Cap End
(A62 not available in 8" bore)



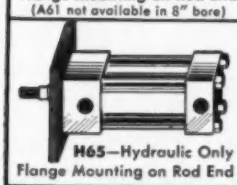
A63—8" Bore only
Flange Mounting on Rod End



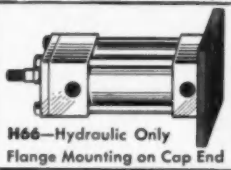
A64—8" Bore only
Flange Mounting on Cap End



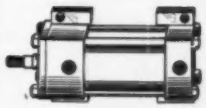
A50 & H50—Tie Rods not extended beyond nuts.
A51 & H51—Tie Rods extended both ends (shown).
A52 & H52—Tie Rods extended. Cap End only.
A53 & H53—Tie Rods Extended. Rod End only.
A54 & H54—Two Tie Rods extended at both ends.



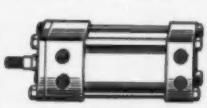
H65—Hydraulic Only
Flange Mounting on Rod End



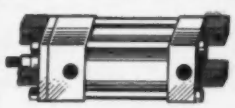
H66—Hydraulic Only
Flange Mounting on Cap End



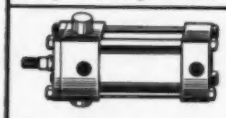
A72 and H72
Side Lug Mounting



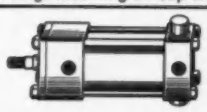
A74 and H74
Side Flush Mounting



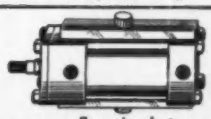
A77 and H77
Side or Foot Mounting



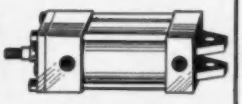
A81 and H81 Trunnion Mounting on Rod End



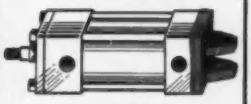
A82 and H82 Trunnion Mounting on Cap End



A83 and H83 Trunnion between Head and Cap (one week delivery)



A84 and H84
Pivot Mounting



A86 and H86
Pivot Mounting

IN STOCK BORES In Inches

"IN-STOCK" STROKES (in Inches)

	BORES	ROD DIA.	ROD TURN DOWN & THREADS		1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
AIR	1½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12									
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12									
	2	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	2½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	3¼	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	4	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	5	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	6	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	8	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
HYDRAULIC	1½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12									
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12									
	2	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	2½	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	3¼	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	4	1¾"	1¼-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	5	2"	1½-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36

(1) (4) (3) (2)

(1) "A" and "H" Models 82, 84 and 86 with strokes over 18" require stop tubes.

Column strength requires larger diameter piston rods for the following:

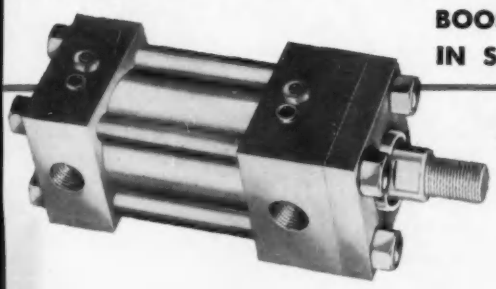
Air Cylinder Models A82, 84, and 86 with strokes inside area (1), when operated at 100 psi and over;

All hydraulic models with strokes inside area (2) and Models H82, 84, and 86 with strokes in area (4), when operated at 2000 psi and over;

Models H82, 84 and 86 with strokes inside area (3), when operated at 1000 psi and over.

Depending upon Trunnion Pin location, "A" and "H" Models 83 with standard diameter piston rods can have longer strokes than Models 82, 84 and 86.

See Miller File #251 for oversize piston rod and stop tube requirements.



BOOSTERS IN STOCK

Immediate Delivery on the following Miller 25 to 1 Ratio Boosters (80 psi air input produces 2000 psi hydraulic oil output): Model B4, 5" bore, 1" dia. ram, 6" and 12" strokes; Reciprocating Booster Model DA77-RBA8, 5" bore, 1" dia. ram, 6" stroke. Also Booster Tanks, 5" dia., 6" and 10" heights.

Write For Catalog and Stock Price List

Miller

MILLER FLUID POWER DIVISION
FLICK-REEDY CORP.

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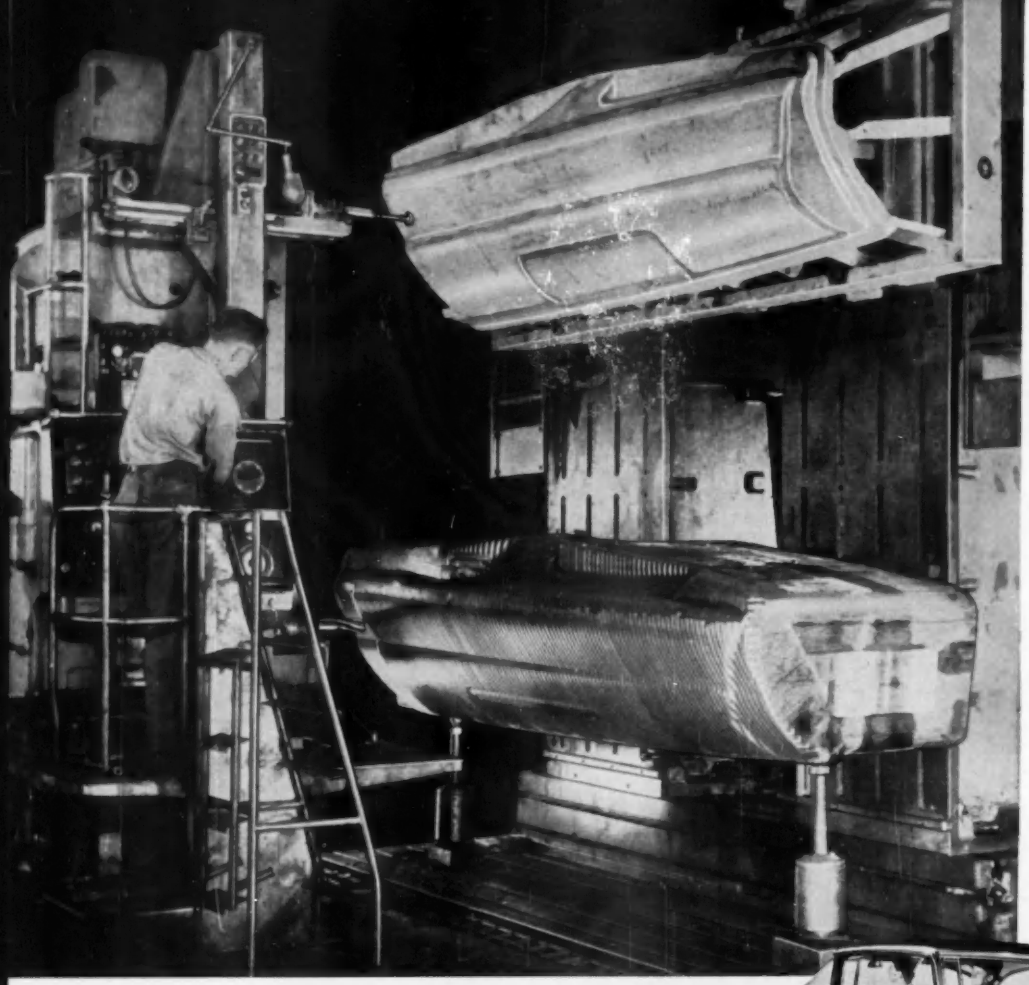
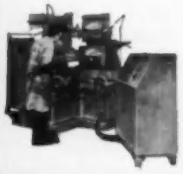
AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS



Helps put the "B-G" in the BiG New 1956 LINCOLN

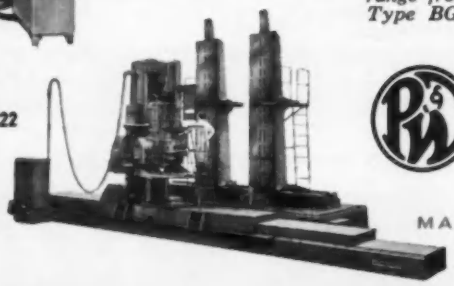
. . . the PRATT & WHITNEY KELLER Type BG-22

Hallmark of Lincoln styling is a distinguished, lithe, trim look with gracefully flowing lines. Producing the huge dies that faithfully translate the designer's drawing board dream into a reality of smoothly formed metal is just one of the jobs done so well by Pratt & Whitney Keller Automatic Tracer-Controlled Milling Machines. Shown here is a big Keller Type BG-22. Following a plaster model, it sculptures the complex contours of a rear quarter panel in solid metal . . . quickly, exactly and, above all, economically.



SMALL . . . or LARGE

There's the right size Keller Machine for every plant, for every job. Capacities range from 36" x 20" (for the compact Type BL) to 20' x 7' (for the giant Type BG-22). Write for complete information outlining your requirements.



TYPE BL

TYPE BG-22

PRATT & WHITNEY COMPANY

INCORPORATED

18 Charter Oak Boulevard, West Hartford 1, Connecticut

Direct Factory Representatives in Principal Cities

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R B & W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

The important facts about nuts

A nut's purpose is to load the bolt in tension for a tight joint. For this, it is given shear strength greater than the breaking point of the bolt; and sufficient bearing area to avoid crushing or flow of the bearing surface with consequent reduction of tension.

While the thread form of a nut is accurate, its "lead" cannot, for practical purposes, be made identical with that of the bolt. Thus, a nut is made from material plastic enough to allow the threads to deform upon tightening and thereby adjust to distribute the load over many threads rather than concentrate it on the first few.

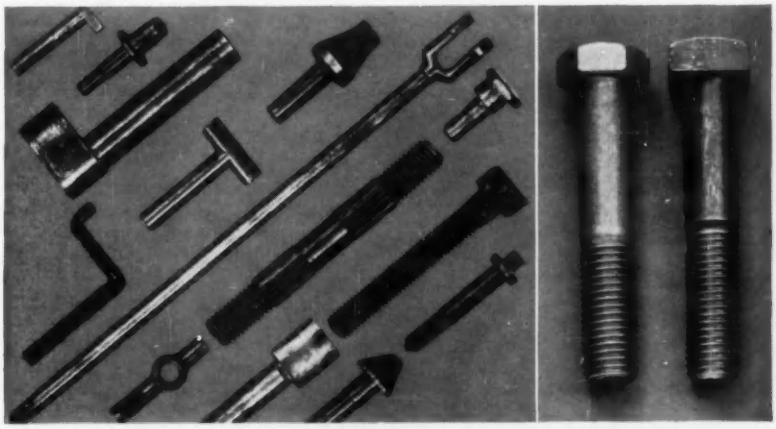
WHAT TO USE

The standard "Finished" nut series satisfies the requirements. It gives not only the required bearing area, but also enough section for proper strength and to minimize the spreading or dilation of a nut when loaded. (The standard "Heavy" nut series is called for only when bolt holes have large clearances, or for high bolt loads.)

As a good general guide to follow, use nuts that are:

1. Made to Am. Std. dimensions;
2. Made from soft, ductile material;
3. Strong enough to break the bolt or screw with which it is used. This would determine whether "Finished" or "Heavy" series is selected.

Cold heading produces strong, low cost parts



Representative range of mechanical parts produced by RB&W by cold heading . . . the same process used to produce the high quality, economical RB&W standard bolts and cap screws shown at right.

Here's a product-improving fact often overlooked: The same forming operation that produces large volumes of strong fasteners at surprisingly low cost can also be used for headed, special mechanical parts.

Cold heading upsets metal along its own axis. Flow lines are continuous, without folds, giving greater head strength against shear, fatigue and impact. Moreover, the material has better quality to start with, since unsound metal would distort or open in the operation and be rejected automatically. Uniformity is assured. Finish is also better.

Designers and production men get all these physical advantages when using RB&W standard bolts and cap screws. They can also have them in special parts at low cost when the need is of sufficient volume to justify machine set-up time. For more information and help on your specific needs, write Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

Plants at: Port Chester, N.Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

30% faster assembly— and joints stay tight

When famous-make chain saws were fastened with regular screws plus washers, they loosened on the job. Then SPIN-LOCK screws were used. These not only held tight, they also speeded assembly time 30%. What's more, they cost no more than former screw plus lock washer.

SPIN-LOCK screws have self-anchors in the form of hardened, tiny teeth which dig in and hold under severe service. Various types, sizes and heads available. Send for data or see Sweet's Product Design File.

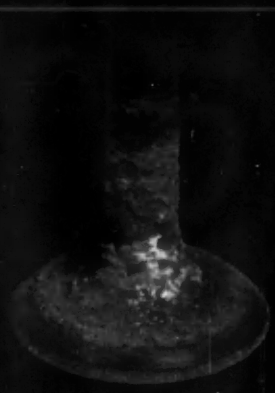
Performance Records Prove Eaton Free-Valves DO Last Longer!

CONVENTIONAL VALVES

Failure unpredictable—anywhere between 5,000 and 40,000 miles. Impossible to set up dependable preventative maintenance schedule.

EATON FREE-VALVES

Still in good condition after 100,000 or more miles, permitting preventative maintenance scheduling. No in-between servicing necessary.



The Eaton Free-Valve is free of any restraining force set up by the valve spring. The normal creeping tendency of the valve causes it to take infinitely variable positions with respect to the seat at successive lift cycles.

The common goal of valve and engine manufacturers—and truck operators—is to obtain valve life equal to that of other major components, thereby eliminating the necessity for valve servicing between major overhauls. Performance records covering millions of miles of heavy-duty operation prove that Eaton Free-Valves have achieved this goal.

Eaton Free-Valves are genuinely "free"—free to turn at random in either direction, during a major portion of the lift-cycle. This free-floating action wipes stem and seat free of deposits; keeps a film of oil on stem and guide surfaces. Scuffing is prevented, wear is reduced. Hot-spots due to local leakage are eliminated. Longer valve life is a natural result.

Our engineers will be glad to explain how Eaton Free-Valves can be applied to engines of all types and sizes.

EATON

VALVE DIVISION
MANUFACTURING COMPANY
9771 FRENCH ROAD • DETROIT 13, MICHIGAN

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

SELF-LOCKING "PLACE" BOLTS

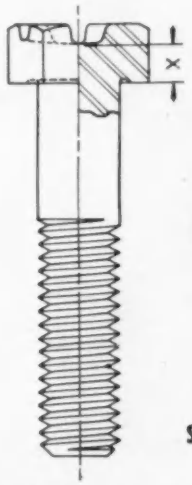
...cut costs...add strength

. . . wherever involuntary loosening or fatigue is a problem!

In some typical automotive and farm equipment applications, for instance, "Place" Bolts are being used as connecting rod bolts, main bearing cap screws, and flywheel bolts.

Here, and wherever a locking bolt may be needed, the Slotted-Type "Place" Bolt offers not only positive locking action but economy and additional strength. It cuts costs because no additional parts or operations are needed. It adds strength because its controlled spring action guards against impact, shock and fatigue failures.

National makes the Slotted-Type "Place" Bolt in carbon or alloy steel, in any of a wide range of sizes. Write us for additional information, including our illustrated folder.



HERE'S HOW SLOTTED-TYPE HEAD LOCKS

The flexible diaphragm formed between slotted segments in the upper face of bolt head and circular recess adjacent to the shank in lower face (section X) acts as controlled spring element when head is properly wrenched against a rigid seat. Diaphragm is reinforced by the continuous-grained segment cold formed between upset slots in upper face.

U. S. Patent No. 2543705

THE NATIONAL SCREW & MFG. COMPANY
Cleveland 4, Ohio

Pacific Coast: National Screw & Mfg. Co. of Cal.
3423 South Garfield Ave., Los Angeles 23, Cal.

National PRODUCTS

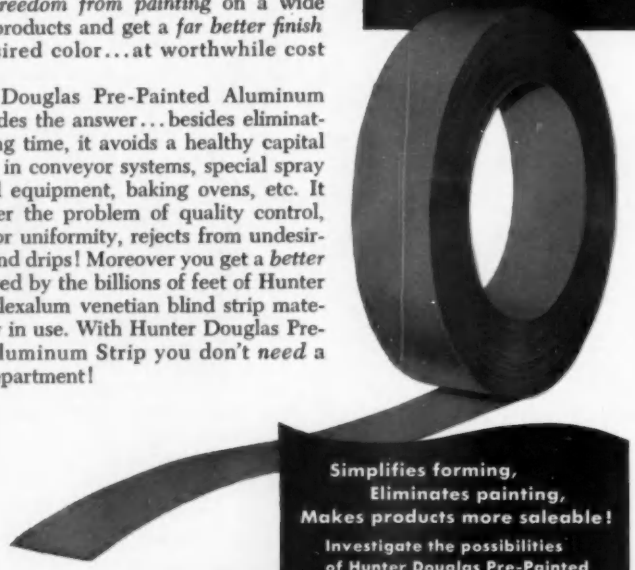
Fasteners Hodell Chains Chester Hoists

You don't have to PAINT when you use

HUNTER DOUGLAS
Pre-painted
ALUMINUM STRIP
and you get a
BETTER PRODUCT FINISH!

Manufacturers using strip stock can now enjoy *complete freedom from painting* on a wide variety of products and get a *far better finish* in any desired color... at worthwhile cost savings!

Hunter Douglas Pre-Painted Aluminum Strip provides the answer... besides eliminating handling time, it avoids a healthy capital investment in conveyor systems, special spray booths and equipment, baking ovens, etc. It ends forever the problem of quality control, lack of color uniformity, rejects from undesirable runs and drips! Moreover you get a *better* finish, proved by the billions of feet of Hunter Douglas' Flexalum venetian blind strip material already in use. With Hunter Douglas Pre-Painted Aluminum Strip you don't *need* a painting department!



Simplifies forming,
Eliminates painting,
Makes products more saleable!

Investigate the possibilities of Hunter Douglas Pre-Painted Aluminum Strip now!

FORMS READILY WITHOUT DAMAGE TO PAINTED SURFACES—Now parts can be readily roll formed, embossed, stamped, even *deep-drawn through several successive stages* without marring, cracking or scratching this hard, bright, lustrous, pre-painted surface!

MAXIMUM ADHESION—Chemically prepared surfaces are specially primed, followed by a second coat of enamel—with each coat individually baked. Bond is exceptionally strong. Edges cut clean and sharp, are free from flaking and chipping.

EXTERIOR DURABILITY COMPARABLE TO AUTOMOTIVE FINISHES—Unusually color fast in sunlight, resistant to heat and cold; successfully passes extreme 500 hour, 90°, 20% salt spray test with no lifting or blistering.

WIDE COLOR SELECTION—Colors to harmonize or contrast with other décor.

STOCK SPECIFICATIONS—If your production can use mill quantities (20M lb./minimum) in widths up to 8", nominal thicknesses, get our quotations.

Hunter Douglas Aluminum Corporation

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News of the MACHINERY INDUSTRIES

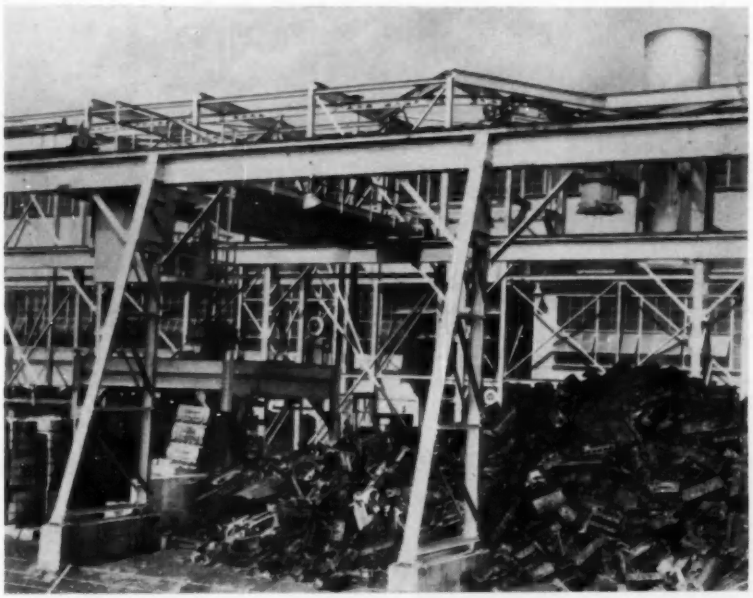
By Thomas Mac New

Chambersburg Engineering Puts Impressive New Foundry at Service of Machinery Industries. Castings Up to 150,000 Lb Turned Out Efficiently at Lower Cost

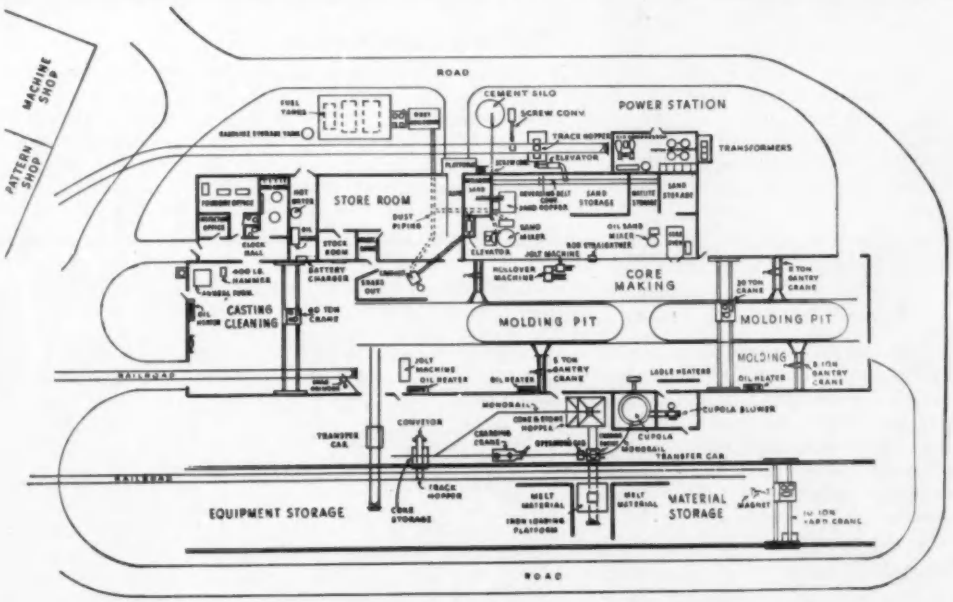
CECO Shows New Foundry

Castings up to 150,000 lb can be poured in the new foundry recently put in operation by Chambersburg Engineering Co., Chambersburg, Pa. Built at a cost of over $1 million, the facility is being utilized basically for castings used in the machinery industries. Currently, about 50 to 70 per cent of the tonnage capacity is for captive requirements. Using the cement sand technique for molds, Chambersburg's engineers claim that they can hold an ⅛ in. across a 30 ft span in any casting. The greater mold accuracy and strength of cement-bonded sand results in better surface finishes and permits practically all types of pit molding.

The two molding pits in the foundry are 120 ft long and 20 ft wide, and each is surrounded by concrete aprons to permit full use of materials handling equipment. One cupola, installed by Whiting Corp., serves the entire foundry with its 40,000-lb-per-hour melting capacity. Alloy irons as



It is of interest that the new Chambersburg Engineering foundry digests in its cupola some 4000 scrap engine blocks per month along with pig iron.



Layout of the new Chambersburg Engineering foundry. The well engineered facility has been designed for efficiency and economy of operation in handling castings up to 150,000 lb. Its 40,000 lb per hr capacity cupola will serve the entire foundry with both gray and alloy iron, including ductile iron.

well as gray iron are utilized for the various castings.

Proper materials handling equipment is a prerequisite to good foundry practice and economical operation. Chambersburg, in equipping the new foundry, purchased Whiting 30 and 60-ton cranes, as well as Gehr gantry cranes, for the casting floor, Baker electric and Clark gasoline industrial trucks, and a Whiting 10-ton yard crane as the nucleus of its handling network.

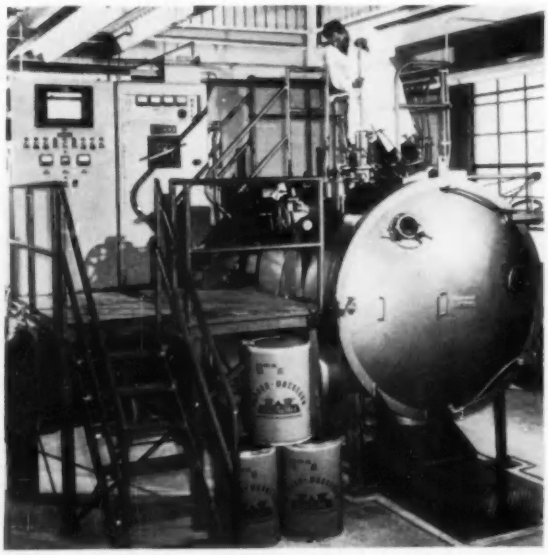
Norton Opens West Coast Plant

Grinding wheels, mounted points, segments, and diamond wheels are now coming off the production line of the new Norton Co. plant in Santa Clara, Calif. The facility is equipped with automatic electric tunnel kilns, automatic machines for small wheels, dust control equipment, and modern handling equipment. At present, the 50,000 sq ft plant is equipped to manufacture grinding wheels up to 14 in. diam with both vitrified and resinoid bonds.

Vacuum Furnace Ready For Experimental Use

Cannon Muskegon Corp., Muskegon, Mich., has put in a 300-lb capacity vacuum furnace that is available for outside experimental or production use. The furnace is primarily intended for the production of iron, nickel, and cobalt-base alloys up to temperatures of 3000 F. It operates at less than 10 microns of pressure.

George W. Cannon, Jr., president of the company, states that it is the aim of the firm to get production up to 20,000 lb of vacuum melted alloys per month this year. He went on to say that the cost of vacuum melted alloys is about $3.00 per pound higher than corresponding air-melted alloys.



Vacuum furnace installation at the Cannon - Muskegon plant.

The furnace is basically a tank six ft in diameter and seven ft long, in which an induction furnace sets on support trunnions. Water jacketing is used around the tank to prevent overheating. The vacuum system consists of two, 10-in. diffusion pumps which are backed up in normal operation by two mechanical pumps. Three thermocouple gages and an ionization gage continuously indicate the pressure at different points in the system.

Cutting Tool Studies

Three research studies of metal cutting tools and materials have just been released by the Government. Conducted by Watertown Arsenal, they include a report on the utilization of ceramics and two surveys of current literature available on aluminum oxide base cutting tools and bainitic hardening of high-speed tool steels, respectively.

For the ceramic study, 14 types of ceramics were used in the cutting tool tests in conjunction with workpieces of steel, brass, and iron. A standard 18-in. engine lathe was used for all research.

The study points out that ceramic tools of alumina base composition were successful in turning a variety of metals at considerable higher than normal maching speeds in continuous cutting operations. Under the conditions of the tests, three aluminum oxide base materials gave superior performance as compared to the general level of the 14 ceramics studied.

All of the reports are available from the Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C.

Lighter Cars Held Likely Without Sacrificing Room

Will the small car ever be produced in large volume? While some advocates contend that the market potential for such a car will increase in the coming years, the more realistic observers believe it is far from becoming a challenge to present size automobiles.

Although future automobiles will be lighter, they will be just as roomy as they are today, in the opinion of Alfred L. Boegehold, manager of General Motors Research Staff Facilities. Much lighter automobiles will be possible as a result of increased use of such metals as aluminum and magnesium, which in turn will permit higher fuel economy, he points out.

While Mr. Boegehold does not dismiss the possibilities of the gas turbine engine, he says power plants which have the lowest weight per horsepower should be developed to increase fuel economy. Engine efficiency also must be further increased. Although a 13 to 1 compression ratio is possible, development will depend largely on whether octane rating of gasoline is increased, Mr. Boegehold states.

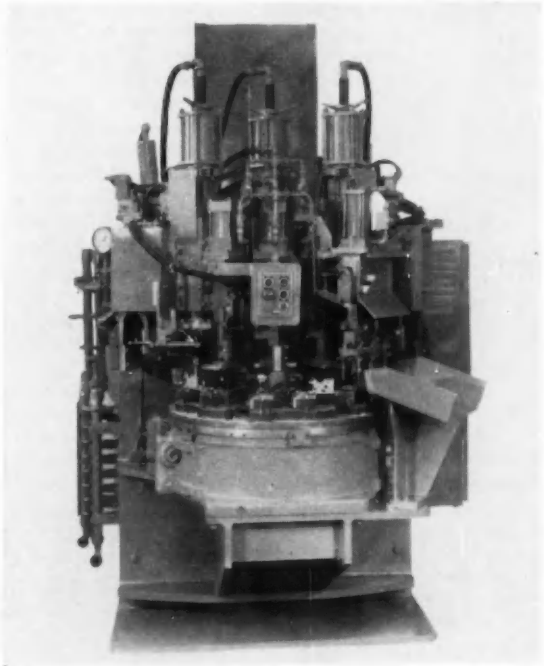
Ford To Host Educators At Conference In July

Educators once again will be given the opportunity to see how the automobile industry functions when Ford Motor Co. sponsors its second annual Education Forum from July 15 to 28. Tours, demonstrations, and other special activities will be included in the program.

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Hot Upsetting Machine Joins Small Stampings

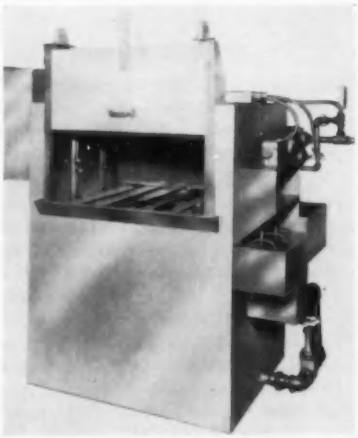


Shown here is a hot upsetting machine that includes a special triple-station, dual ram resistance welder with Geneva index table. The machine assembles automobile door locks by heating and upsetting the ends of three tabs on a cover cup which penetrate openings in the base plate, providing an out-board bearing for the lock gear. Assemblies are loaded and processed by pairs. Production is said to be limited only by operator loading time requirements. (Taylor - Winfield Corp.)

Circle 30 on postcard for more data

Automatic Small Parts Washer

DEVELOPED for cleaning small parts, an automatic machine, which occupies only 10 sq ft of floor space, is adaptable for washing, rinsing and drying in all metalworking fields. Savings in cleaning time are possible where still tanks, manual cleaning operations, or inefficient equipment are replaced by this machine, which can process up to 40 baskets of parts per hour.



Ransohoff parts washer

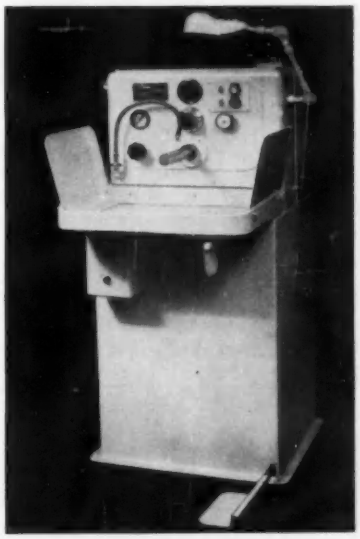
The completely automatic unit cleans two baskets or other loads of parts in one load. Maximum overall size of each basket is 21½ in. long, 14¾ in. wide and 14 in. high. The baskets are loaded into the cabinet and the door is closed. This starts an automatic, adjustable time cleaning cycle in the following sequence: hot recirculated cleaning solution spray for 30 sec, hot water rinse spray for 60 sec and a drain-dry for 90 sec. *Ransohoff, Inc.*

Circle 31 on postcard for more data

Honing Machine

ONE of the features of the Model H.M. Honemaster, a manually operated honing machine which is the latest addition to a line, is a hydraulic system which is said to maintain constant pressure. Stone pressure control is adjustable to the diameter of the piece and material being honed; stone wear or stock removal causes no fall off of pressure; and constant cutting action is assured, it is claimed. The hydraulic system also operates the clutch and brake mechanism.

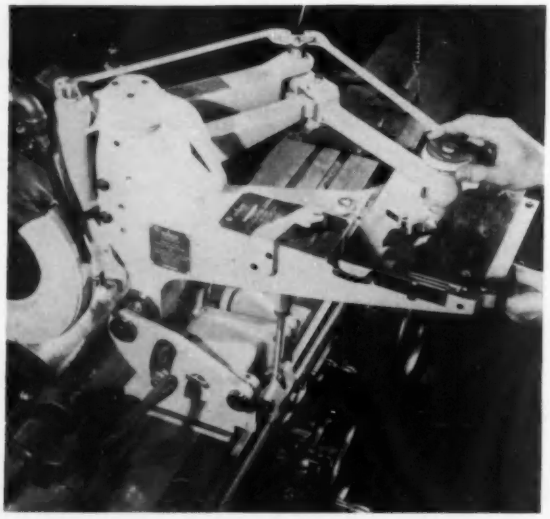
The single control sizing dial indicator is set by honing the first piece to finish size. Thereafter it is only necessary to compensate for stone wear. This sizing dial indicates when the piece is coming to size. Infinitely variable spindle speed, 100 to 900 rpm, provides speeds for work of various diameters, materials or finishes. A tachometer is part of the equipment. The hydraulic oil and coolant oil is self-contained in one divided steel fabricated tank; and the hydraulic suction line includes a filter unit. The machine can be operated from either the foot pedal or knee pedal which are provided. *Superior Hone Corp.*



Model H.M. Honemaster

Circle 32 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT



Pratt & Whitney Model No. 10 Diaform form-trues grinding wheels up to 14-in. diam. Maximum width of form produced on the wheel is 2-in.; maximum depth of form is 1-in.

Attachment Speeds Form Truing on Grinders

ANNOUNCED is a form truing attachment designed for use on universal internal and external cylindrical grinders. Known as the Diaform Model No. 10 Universal, the new attachment is said to make it possible to form-true complex contours on grinding wheels accurate to "tenths." Equally accurate repeat truings can reportedly be made as often as required.

Mounted on the grinding machine table by an auxiliary carriage, the unit is out of the way during grinding operations, but is quickly available for re-truing without disturbing the work piece. The auxiliary carriage provides vertical adjustment for centering the truing diamond to the grinding wheel to suit different makes of machines.

In operation, a tracer is lightly traversed over the profile of an enlarged template of the desired form. Path of the tracer is transmitted at a 5:1 reduction ratio to a truing diamond that reproduces the form in the grinding wheel. Since a sharp diamond is used, the wheel is dressed as it is form-trued. *Pratt & Whitney Co., Inc.*

Circle 33 on postcard for more data

Deburrs Tapped Hole

BY the use of a device called the BURR-BIT, chamfering a tapped hole may be accomplished while tapping, according to an announcement. The device is placed over the tap, tightened in position, and operates while the tap is being withdrawn, shaving off the raised thread or burr.

It is said to be a precision product made of high-speed tool steel. A special setscrew running inside the flute of the tap does the driving. The tool can be used on various materials, including steel, cast iron, aluminum and plastics; and is applicable where the material to be tapped is thin, because the chamfer is made just deep enough to remove the burr without removing too many threads, the company explains.

It will fit two and four fluted taps from No. 2 to 5/16-in. in all pitches. *Vernon Devices Co.*

Circle 34 on postcard for more data

Vernon Burr-Bit

Sound Meter-Analyzer

AN electronic instrument, whose purpose is to determine whether a noise hazard exists and to locate the sources, was recently introduced as an aid in combating industrial noise. It is said to be the first that combines in a single, portable unit the four principal functions necessary to measure and analyze noise accurately. Called the Soundscope, the instrument serves as a meter to measure overall sound levels. It also operates as an analyzer, measuring sound in each of eight octave bands to determine noise peaks. In addition, it can check sounds in narrower frequency bands. Electrical and acoustical calibrators are built into the unit.

When used as a sound level meter, the instrument picks up noise through its microphone, and the sound pressure level is measured by passing the electrical signal through attenuators and amplifiers to the meter. The reading appears on the meter calibrated in decibels. Measurement range is from 24 to 150 db. In the analyzer section, noise is filtered into any of the eight principal octave bands, from 75 to 19,200 cycles per second. Noise peaks in each of these bands then can be measured individually. For finer analysis, by frequencies within the octave bands, continuously variable filters are used.

Sub-miniature vacuum tubes, 14 in number, are used, along with printed circuits, to reduce the size of the instrument and prolong the service life of the seven dry-cell batteries that supply power. The entire unit, weighing 20 lb, measures 16-in. long, 7¾-in. wide and 7-in. deep. The control dials are located on one panel and readings are indicated by a single meter.

In addition to its use in noise abatement programs, the instrument is said to have possible application in assisting manufacturers to eliminate undesirable sounds emanating from moving parts of products. *Mine Safety Appliances Co.*

Circle 35 on postcard for more data

Hydraulic Pumps

THE Hydreco PA-3000 series base mounted gear-type hydraulic pump, designed especially for industrial use, has a straight key shaft for pulley drive or rigid and flexible couplings, operates at pressures up to 1500 psi at 2000 rpm, and delivers 40 to 70 gpm. Pressure balanced wear plates permit a fixed clearance to be maintained between the wear plates and the gear faces regardless of pressure. Thus oil slippage is reduced to a minimum, and there is no excessive power loss due to the force of the plate against the gears, it is said. *New York Air Brake Co.*

Circle 36 on postcard for more data

Heavy-Duty Conveyor

EQUIPPED with a wire mesh belt and designed for heavy loads, including the handling of hot forgings and heavy objects with slick surfaces, a new conveyor has been unveiled for taking material directly from presses, benches or loading docks and transferring to other operations, stock boxes or conveyor lines. It comes equipped with casters and handles placed on each side for ease of movement where desired. The wire mesh is available in a variety of weaves, spacing and size of flight; and the conveyors in a number of standard sizes. *Cooney Industries, Inc.*

Circle 37 on postcard for more data

Feeder for Heavy Parts

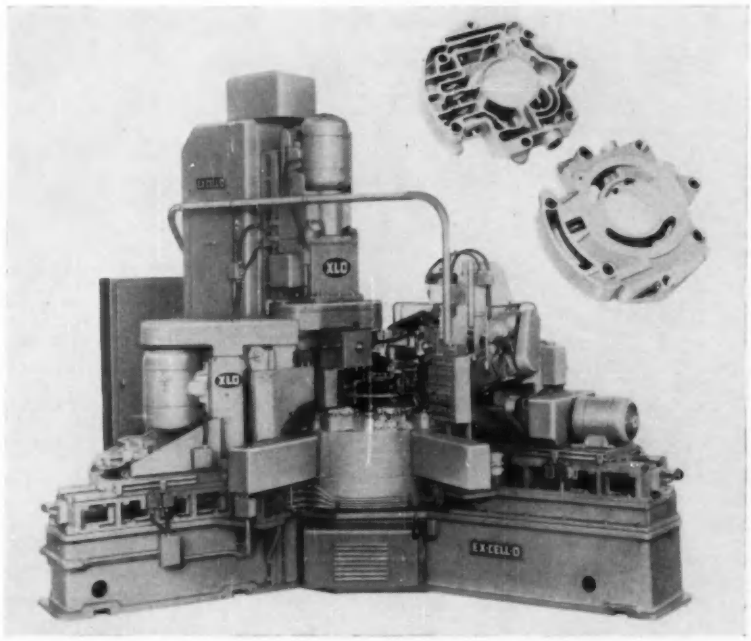
AN automatic storage feed hopper for parts and bar shapes ranging

Campbell storage feeder

up to three-in. square cross-section and lengths to 16-in., has been revealed. Hopper capacity is 35 cu ft or 15,000 lb. It will automatically orient and feed bar shapes and parts from its storage bin to furnaces, presses, secondary operation, washing machines, etc., at production rates of 1000 pieces per hour.

The illustrated unit feeds 1¾-in. diam by 8-in. long heavy wall tubes to a finish machining line at the rate of 360 tubes per hour. The bin holds enough tubes for eight hours of continuous production. These tubes are delivered from the storage bin to the short feed tray at the right of the machine. Flow of tubes from the bin is controlled electrically by the number of tubes at the feed tray. The processing machines are fed from the feed tray. *Campbell Machines Co.*

Circle 38 on postcard for more data



Rearrangement of standard Ex-Cell-O units changes this special machine for production of the redesigned transmission parts shown

Special Machine Handles Altered Workpiece

CHANGING a workpiece from its original form need not make obsolete the special machine used to produce it, according to an announcement. The unit pictured is typical of such a special machine, redesigned and rebuilt to process a workpiece thus changed. While this involved no major alterations, certain changes in the tooling and operational cycle of the machine were made necessary. As rearranged for its new production job, this machine is equipped with a six-station rotary indexing table. Each station has two fixtures, to permit reloading for operations on the reverse side of the part, after the first side has been machined. A hydraulic cam clamp retains the workpiece through the machining cycle.

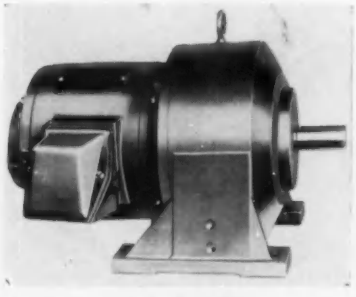
The workpiece is an aluminum regulator valve body for an automotive transmission. Machining includes fly-cutting both flat sides, drilling and reaming two piston holes, drilling three angular holes, and drilling, reaming and chamfering the top holes. Flatness of the two sides is an important requirement. Net production rate is 120 parts per hour. *Ex-Cell-O Corp.*

Circle 39 on postcard for more data

Gearmotors

GEARMOTORS, in a new line, are available in both a-c and d-c from 1 through 60 hp. They are said to combine the latest design principles of mechanical gearing and electrical motor development, and to be designed and built to give long trouble-free performance under adverse operating conditions. Two-way seals lock oil in so that the gearmotors may be mounted in virtually any position without oil leakage. Induction hardening provides hard tooth surfaces on alloy steel gears, making a combination of strength and wear resistance. A wide selection of mountings, enclosures, and ratios is reported to be available. *Reliance Electric & Engineering Co.*

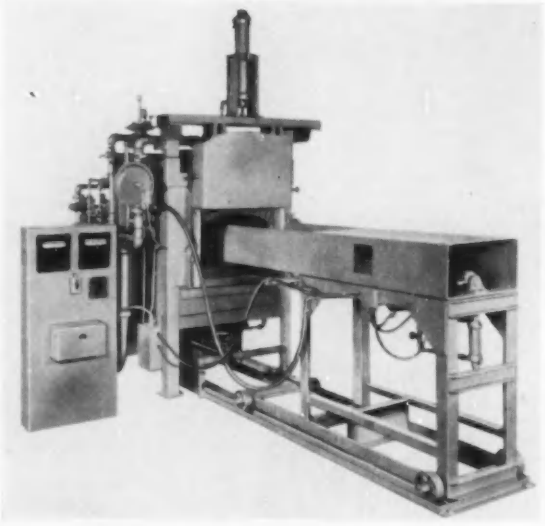
Circle 40 on postcard for more data



Reliance gearmotor

NEW PRODUCTION and PLANT EQUIPMENT

Aluminum Furnace Has Automatic Loading Tray



Eclipse aluminum melter with autoloader in loading position as tray tilts up and ram pushes metal onto the melting hearth

THE development of an aluminum melting furnace that is provided with an automatic loading tray and is of the non-tilting type, has been announced. The operator loads risers, gates and ingots into the loading tray of the autoloader. When the furnace is ready for recharging, actuation of an air valve will load the metal automatically.

Air cylinders power the autoloader, which operates in the following sequence: When the start button is pushed, the carriage moves to the door of the furnace; the door opens, actuating a limit switch that turns the melting burner to low fire; the loading tray tilts up to the sloping hearth; and a ram pushes the charging load off the tray onto the hearth; ram retracts, door closes; and carriage returns for the next load. The burner then goes back to high fire to melt the new load.

A packaged control center is furnished which includes two Wheelco Model 401 Capacitrol indicating controllers, one for each burner. These Capacitrols control the company's CR automatic temperature control valves which modulate the air supplied to the burner from the blower. The nozzle mixing burners are mounted in the roof of the furnace to fire down into the melting and holding chambers. *Eclipse Fuel Engineering Co.*

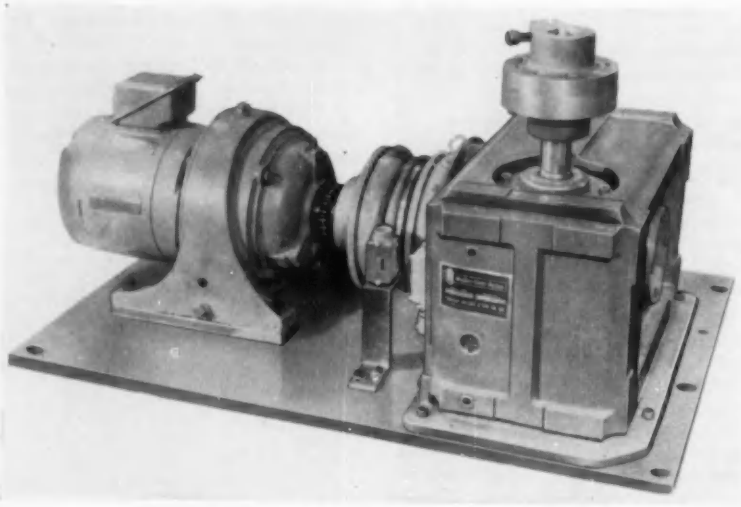
Circle 42 on postcard for more data

Packaged Power Unit for High Speed Indexing

NOW available is a completely assembled power-indexing unit for straight line transfer machines or other indexing equipment. Known as the "Trans-Pac," it includes gearmotor, control shaft drive sprockets, brake actuating cam and microswitch, electric clutch-brake combination and mounting ring, indexing mechanism and drive shaft coupling. Components, mounted on a steel base plate, are ready for inclusion in a machine and only require necessary connections to control panel and driven parts of the machine.

The indexing mechanism features modified trapezoid acceleration characteristics (initial force of zero and a gradual increase to maximum acceleration value) to provide smooth vibration-free indexing. It is rated for a minimum of 8000 hours operation without maintenance; has zero backlash and an accuracy of 0.001-in., the company states. An electric clutch-brake combination provides remote control of dwell and permits jogging and inching of machine elements. *Ferguson Machine & Tool Co.*

Circle 41 on postcard for more data



Ferguson "Trans-Pac" packaged power-indexing unit

Liquid Cooling Units

COMBINATION air and water cooled electric-refrigerated liquid chillers for cooling liquids such as coolants and hydraulic oils and which use water as an auxiliary in excessive high production or hot weather, are now offered. When operating under normal conditions, air only is used as the cooling medium for dissipating heat. When pressures on the air cooled radiator exceed those in normal operation, water enters the system relieving the pressures automatically. As the pressure decreases the water is automatically cut off. This system is recommended in localities where water is scarce or where present drain systems are used to near capacity. With properly balanced chillers, it is said that temperatures on coolants can be held to a given temperature all day long. *Lundholm Manufacturing Co.*

Circle 43 on postcard for more data

Conversion Coating

A CONVERSION coating for aluminum and zinc, designed to meet Specification MIL C-5541, has recently been introduced. Known as ChromiCoat, it is said to impart resistance against corrosion and to improve paint adherence. The coating, which becomes integral with the treated metal surface, reduces paint chipping and flaking. If the surface should be damaged, the treatment is said to confine corrosion within the area of the exposed metal—corrosion does not creep under the undamaged paint to cause blistering. ChromiCoat is used at concentrations of two to three ounces per gallon of water at temperatures up to 100 F in either tank or washing machine. Solutions may be held in stainless steel, or polyethylene or Koroseal-lined steel tanks. *Oakite Products, Inc.*

Circle 44 on postcard for more data

Folders and Brakes

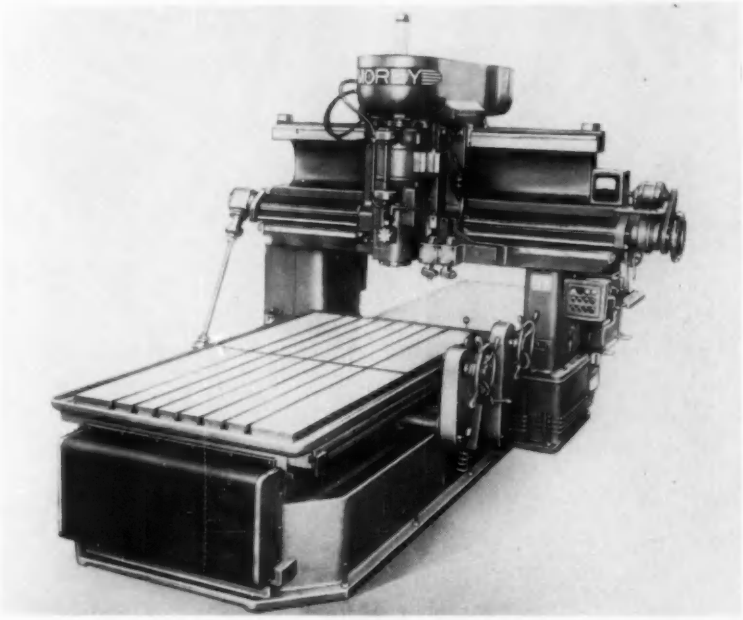
MODERNIZED lines of folders and brakes are now available in several models to meet a wide range of sheetmetal folding requirements.

The adjustable bar folders, for making folds of limited widths along the edge of the sheet, embody such features as: clamping and folding with one motion of handle; adjustable gage and jaw for accommodating different width folds and various thicknesses of material, respectively; and self-contained spiral spring counterbalance requiring no extra bench space. The machines are available with working lengths of 21 thru 42 in. There are four hand-operated models and three air-actuated.

A foot brake, with a 36 in. working length, produces bends any distance from the edge of the sheet. Its gage, for locating the bend, can be attached to either the front or rear of the machine.

For a variety of folding operations, universal folders and brakes are said to produce accurate, uniform folds of any width. They are equipped with a front gage for narrow folds and a back gage for wide folds. An adjustable clamping bar accommodates special or slotted clamping blades up to two inches thick. The folding bar is adjustable for sharp folds or rounded bends. Two adjustable stops produce various angles of bend. There are two models with 30 and 42 in. working lengths. *Niagara Machine & Tool Works.*

Circle 45 on postcard for more data



Morey No. 50MA "Aerogrome" profiler-miller with power feed to table and infinitely variable feeds from 0 to 160 ipm.

Profiler-Miller for Large Parts

A NEWLY designed profiler-miller has been introduced, known as the No. 50MA. The first unit completed has a table 48 by 120-in.; width between columns 60-in.; distance between table and spindle 21-in. Spindle is driven by a 40-hp motor, with provision for 18 speeds from 44 to 4800 rpm. The machine is equipped for hand profiling of ferrous and nonferrous metals.

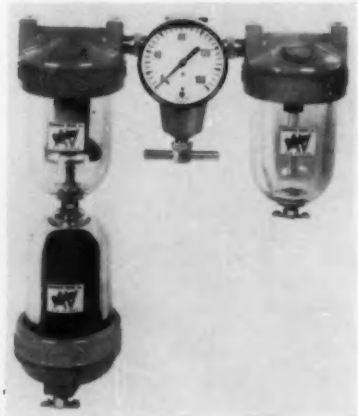
It is available with tables from 48 by 48-in., in increments of two-feet, up to 144-in. Additional widths and lengths are obtainable to suit customer requirements. Also available are power feeds with speeds up to 320 ipm, power feeds for transverse movement, vertical tracing, 360 deg tracing or three-dimensional tracing systems. *Morey Machinery Co., Inc.*

Circle 46 on postcard for more data

Air Control Assembly

INTRODUCED is a new air control assembly which automatically filters, regulates and lubricates compressed air used in the operation of pneumatic equipment. Sludge, formed of dirt, scale, rust and moisture, is automatically trapped by the filter. A drain trap attached to the bottom of the filter collects moisture from the filter. After the cleaned air is regulated to the desired pressure, a fine oil mist is added by the lubricator. This lubricated air is then carried to the operating parts of the equipment. The assembly provides visibility of operation of each unit, while up to 98 per cent of free moisture is said to be removed at a negligible loss in air pressure. *Airmatic Valve, Inc.*

Circle 47 on postcard for more data



Airmatic air control assembly filters, regulates, lubricates

The 200-ton Bliss press illustrated operates at 20 strokes per minute. Its slide stroke is 16-in., the slide adjustment is 12-in., and the shut height on the bed is 32-in. Bed area is 84 by 48-in.

Two-Point Enclosed Press Features Compactness

INCORPORATING an unusual left-to-right gear drive, a two-point enclosed press design has been developed which is said to require less floor space than previous front-to-back designs. The gear arrangement utilizes twin intermediate shafts which permit mounting the flywheel, clutch and the motor drive in between. This makes a compact drive system which is housed within a box crown that is symmetrical both right to left and front to back.

The design is now being manufactured in capacities ranging from 150 to 750 tons. All are "enclosed" presses, designed for automated production lines by building into the uprights the air and electrical lines needed for auxiliary equipment. In addition, doors and covers which provide access to electric, air, oil and other systems are flush-mounted, as are buttons, switches and other controls. Other features include the use of automation control (an electro-mechanical rotary switch), built-in lights over the die area, and automatic oil lubrication. *E. W. Bliss Co.*

Circle 48 on postcard for more data

Weighing Systems

ANNOUNCEMENT has been made of the EC weighing systems for bin, tank, platform and conveyor applications. They are said to be also adapted to the measurement of jet engine thrust, dynamometer power measurement and wherever force or weight must be measured; and can be used to measure, indicate and actuate control mechanisms for automatic operations. The principle involved is that of a transducer, converting force into hydraulic pressure; this pressure then being used to actuate an indicator, recorder or controller.

These systems are said to be sensitive to one part in 10,000; calibrated to 0.1 pct of load range; and to have the ability to withstand vibratory loading yet give measurement of mean load. They are available in capacities ranging from 5000 to 100,000 lb. *The A. H. Emery Co.*

Circle 49 on postcard for more data

Lapping Compound

UTILIZING tiny diamond particles as an abrasive, a new lapping compound has recently been introduced which features uniform particle shapes and blocky structure of the diamonds for fast cutting speeds and bright finishes. The vehicle of the compound is soluble in water or commercial solvent for cleanliness when changing micron sizes. It is said to have no tendency to thin out with heat or thicken and roll up under usage; and that the material has excellent adhesion to lapping surfaces. *Di-Met Corp.*

Circle 50 on postcard for more data

Micro-Hardness Tester

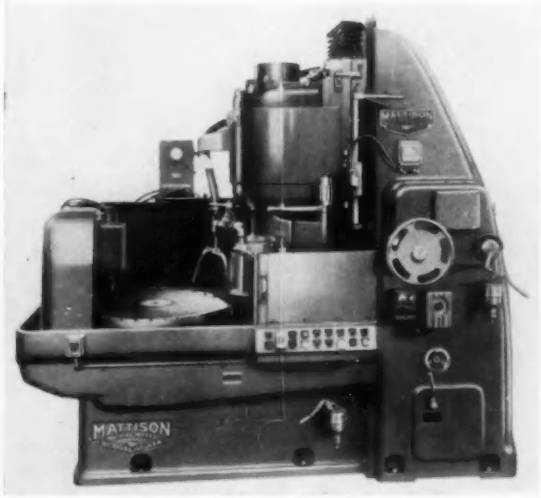
A COMBINATION micro-hardness tester and metallurgical microscope, of non-destructive type, with a load-weight range of from 25 to 1000 grams, and requiring only one minute for a complete test cycle, has been announced. Interchangeable vise accessories permit the instrument to be used for testing small precision ground or lapped parts, small diameter wires, very thin materials or material coatings, thin sheet stock, cutting tool edges and ball bearings.

Vertical capacity is 2⅜ in., and the maximum spread of standard vise jaws is 1 11/16 in. Surface finishes of 40 rms or less can be inspected, and indentations of 0.0004 in. or smaller can be measured to within an accuracy of 0.00008 in. It is further stated that the spot to be indented can be located to within an accuracy of 0.0002 in.

Sheffield tester

When the instrument is used as a metallurgical microscope, the interchangeable objective lenses provide magnifications of 200x and 400x. A camera can be attached to the eyepiece for making photomicrographs. *Sheffield Corp.*

Circle 51 on postcard for more data



Mattison redesigned Models 24 and 36 vertical rotary surface grinders feature automatic cycling, greater strength and rigidity for heavier stock removal, and complete protection of the column and base ways.

Vertical Rotary Surface Grinders

INCREASED stock removal rates and the accommodation of new types of work requiring closer tolerances are said to have resulted from improved vertical rotary surface grinders. Automatic cycling is available through the use of one of two systems that may be installed at extra cost. Either system will provide pushbutton actuated automatic cycling, which includes switching on the coolant pump, moving the table into grinding position, magnetizing the table and starting it rotating, feeding to size according to gage system, sparking out, and returning all elements of the machine to loading position.

The air-gaging system measures the work continuously and gives the operator visual indication that parts are approaching size. The micro-switch automatic sizing system is an electromechanical measuring device which measures the work and actuates the automatic cycle at the completion of the grind.

A new continuous down feed system is said to eliminate mechanical linkages found in ratchet-type feeds and to increase the range of feeds. Another feature is the redesigned base which is stronger and more rigid, with added cross-girths. All ways of the column and base are fully protected, regardless of the position of the carriage or grinding head.

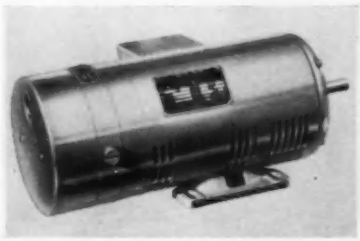
Standard equipment on the Model 24 is a 30-in. magnetic chuck and 18-in. segmented wheel. Available options include a 36-in. chuck and 20-in. wheel. On the Model 36 a 36-in. magnetic chuck is used with an 18-in. wheel. Available options include a 40-in. magnetic chuck and 20 and 22-in. wheels. Both machines are designed for heavy stock removal, with a 40-hp motor standard on the Model 24 (50-hp obtainable on special order), and a 50-hp motor standard on the Model 36. *Mattison Machine Works.*

Circle 52 on postcard for more data

Adjustable Speed Drives

DEVELOPED and now offered are adjustable speed, fractional horsepower, Adjusto-Spede Drives with integral electrically operated friction brakes or integral speed reducers. Two brake ratings, 18 and 36 lb-in. of torque, are available. Speed reductions are obtainable from 5 to 1 to 100 to 1, depending upon the drive horsepower rating. The small single package drive is a combination of a-c constant speed induction motor, eddy-current coupling and electronic control. Standard modifications include either the friction brake or speed reducer.

Connection to a standard power line is the only wiring required. All drives have a continuous constant torque rating through a 25 to 1 speed range. Electronic control reportedly insures speed stability of plus or minus two per cent of top speed at any point within the operating range. *Dynamatic Div., Eaton Manufacturing Co.*

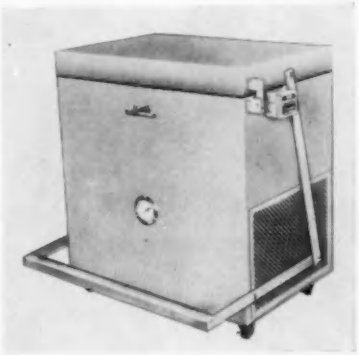


Ajusto-Spede with friction brake

Circle 53 on postcard for more data

Aluminum Rivet Cooler

AN aluminum rivet cooler, with 50 canister capacity, features a mechanical safety locking device and a temperature range to —40 F. It has outside dimensions of 33½ in. long, 23¼ in. wide and 39⅝ in. high. The inside is 27 in. long by 13 in. wide by 11½ in. deep. The mechanical safety locking device is so designed that if the temperature should rise to —20 F the lid is automatically locked, thus preventing use of aluminum rivets which have been exposed to warmer temperatures. A key is required to release the device preventing access to the rivet storage even though the temperature should return to —20 F or lower.



Webber refrigeration unit for aluminum rivets

The cooler is equipped with a temperature control having a temperature range from 0 F to —50 F plus or minus 2° of accuracy. Also standard equipment is a temperature indicator. The units have top opening lids, actuated with a foot treadle, with a suitable design giving self-sealing closing upon release of the foot pedal. Interiors are of heavy gage aluminum; insulation of non-hygroscopic styrofoam. The refrigerant used is Freon. Canisters are supplied for use in the storage compartment, contained in a cadmium plated rack. They are two-in. diam by seven-in. high, with perforated bottoms. *Webber Engineering Corp.*

Circle 54 on postcard for more data

Are you "outgrowing" your present source for castings?

CWC supplies low cost, precision castings in volume to expanding industries!

Growth and expansion! That is the pattern of business today. Naturally, this creates problems, and often one of them is casting supply. Many firms have outgrown their present source—need castings in greater volume at lower costs—and even higher quality to meet today's competition. If this is your case, look to Campbell, Wyant and Cannon . . . the source for the best in iron and steel castings . . . where expert engineering and precision controls are "musts" . . . where volume production at low cost is not a problem.

If you are growing, look to CWC! Consider having the facilities and abilities of this group of six production foundries at your command.

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Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

FREE LITERATURE

Resistance Welding 1

Called a designer's guide for resistance welding, Bulletin 331 explains spot, seam, projection, and flash-butt resistance welding techniques in detail and lists other free literature obtainable from *Sciaky Bros., Inc.*

Screw Machines 2

An eight-page bulletin describing a complete line of single spindle automatic screw machines has been made available by *Cleveland Automatic Machine Co.*

Rhodium Plating 3

A 20-page booklet, intended for electroplaters and product designers, lists various applications and gives methods for electroplating with rhodium. Form 4727. *Baker & Co., Inc.*

Automatic Gaging 4

Catalog 56 AM, 26 pages, explains four gaging systems used for automatic control and describes components that make up each system. *Federal Products Corp.*

Aircraft Fabrics 5

A 16-page bulletin, featuring a complete line of coated fabrics, tubing, packing and tapes for aircraft protective applications, has been released by *Packing Div., Raybestos-Manhattan, Inc.*

Single-Stage Pumps 6

Bulletin 7248-A, eight pages, describes a redesigned line of single-stage centrifugal pumps intended for general hydraulic uses and includes selection data. *Ingersoll-Rand Co.*

Assembly Machine 7

The principle of operation of an automatic machine that can assemble a variety of electrical, electronic and mechanical products is described in a 12-page brochure released by *Multra Corp.*

Investment Casting 8

Design data for the production of investment castings are outlined in 40-page booklet F-30017 published by *Haynes-Stellite Co.*

Switches 9

Listed in 12-page Catalog C is a complete line of push, slide, toggle and rotary switches for aircraft, automotive, electronic, motor control and special applications. *Carling Electric, Inc.*

Electric Brakes 10

Eight-page bulletin WEB-6212, describing a line of electric brakes, clutches and clutch-brakes for industrial machinery and mobile equipment, has been published by *Warner Electric Brake & Clutch Co.*

(Please turn page)

VOID After Aug. 15, 1956 **6/15/56**

Circle code numbers below for Free Literature, New Plant Equipment, or New Product Information

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21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
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Bulk Conveyors 11

Bulletin 455, 12 pages, discusses the design and use of conveyors for handling such bulk materials as scrap, coal, ashes, sand, gravel, etc. *Jervis B. Webb Co.*

Pressure Testing 12

Standard and special-purpose pressure test machines for automotive, aircraft, and other applications, including automation line installations, are described in Bulletin PT-1, four pages, available from *Modern Industrial Engineering Co.*

Die Cushions 13

A 24-page catalog lists pneumatic, multiple piston pneumatic, pneumatic locking, hydropneumatic and custom-type die cushions for presses, with performance and dimensional data. *Danly Machine Specialties, Inc.*

Plastic Tooling 14

"Why Plastic Tooling?" tells how tooling compounds based on Bakelite epoxy resins can cut production costs and simplify model changeovers by providing inexpensive, easy-to-build jigs and fixtures, forms, patterns and dies. *Bakelite Co., a Div. of Union Carbide and Carbon Corp.*

Hardness Testers 15

The functions of Tukon machines for micro and macro hardness testing, using shallow indentations, are covered in 12-page bulletin, DH-328, issued by *Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc.*

USE THIS POSTCARD

Transmissions 16

Seven models of the Plan-Gear Transmission, a planetary gear type available with one or two forward speeds and in 85 or 150 to 200 lb-ft torque, are described in an eight-page booklet, which includes design data and possible applications. *American Gear & Manufacturing Co.*

Preview Catalog 17

A 28-page preview catalog of the contents of 24 bulletins covering feeding equipment for punch presses, and reels and straightening machines for coil stock, has been released by *F. J. Littell Machine Co.*

Phenolic Material 18

Catalog C-56 gives technical data and specification tables covering Celeron in its various forms and types, and includes information on design, molding and machining. *Continental-Diamond Fibre Div., Budd Co., Inc.*

Variable Speed Drives 19

Booklet 20P50, 44 pages, contains multi-color tables for the selection of variable speed Texrop drives. Included also is information on design features, drive principles, and horsepower ratings. *Allis-Chalmers Manufacturing Co.*

Design Services 20

Design services, including research and development, fabrication of working models, design finalization, and cost determination, are outlined in a six-page folder issued by *Pioneer Engineering & Manufacturing Co., Inc.*

Pipe and Tubing 21

Technical data folder TDC-154A gives the maximum allowable stress values at various temperatures for a complete range of seamless and welded carbon, alloy and stainless steel tubing and pipe. *Babcock & Wilcox Co.*

Tracer Milling 22

Bulletin 3D-1, four pages, describes a three-dimension tracer milling unit designed for taking numerous cuts on large workpieces by moving the cutter instead of the workpiece. *Sundstrand Machine Tool Co.*

Force Gage 23

Bulletin 11E illustrates applications of a mechanical force gage for precision measurement of pressure, tensile, or torque that can be used separately or incorporated directly in special testing devices. *W. C. Dillon & Co., Inc.*

VOID After Aug. 15, 1956 **6/15/56**

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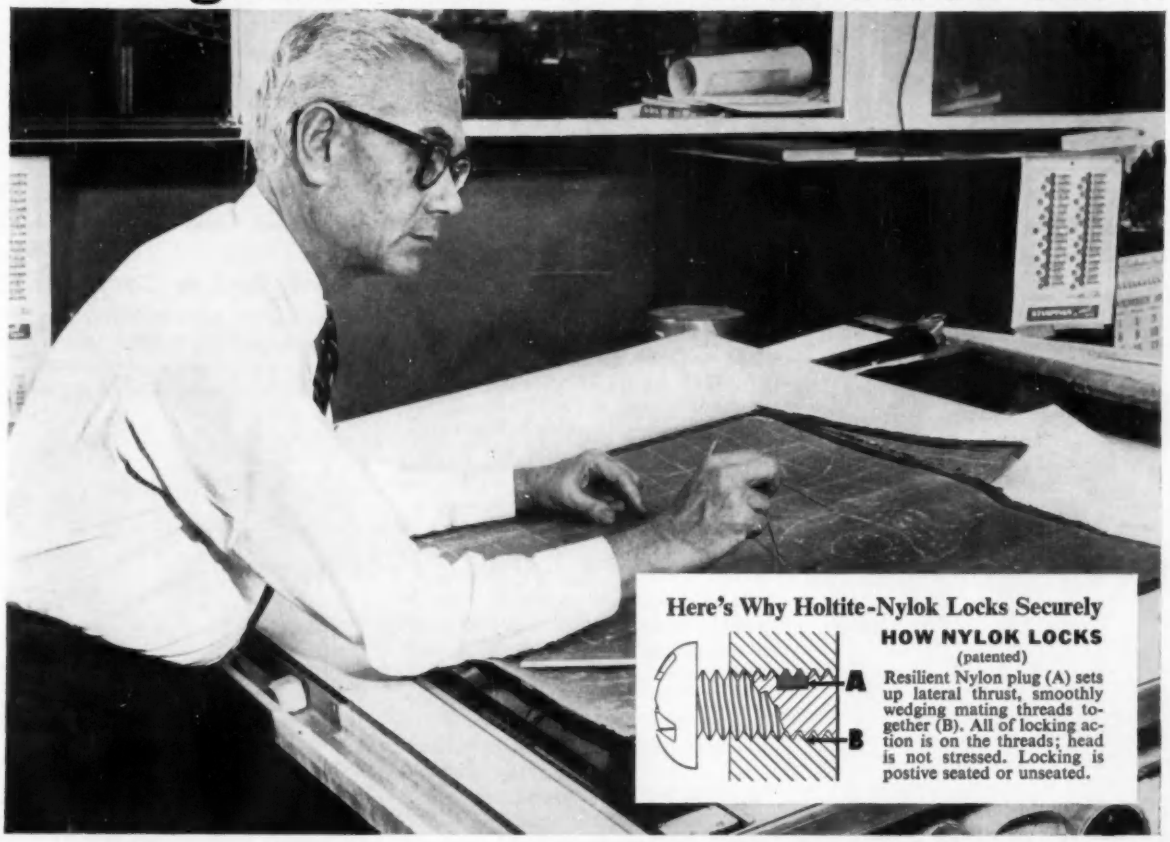
The Engineer from Continental Screw Co. ...


Here's Why Holtite-Nylok Locks Securely
HOW NYLOK LOCKS
(patented)
Resilient Nylon plug (A) sets up lateral thrust, smoothly wedging mating threads together (B). All of locking action is on the threads; head is not stressed. Locking is postive seated or unseated.
A
B

...will study your specific requirements for Holtite Nylok Screws at no cost to you!

Talk to the Engineer from Continental about 1-piece self-locking screws and bolts

Manufacturers all over the nation are saving time and money by switching to Holtite Nylok Screws. These amazing self-locking screws and bolts eliminate safety wire, lock washers, jam nuts, and various other locking devices.

The secret behind their smooth efficiency is a nylon insert in the threaded section which provides a positive-locking action. Seated or unseated, they lock where they stop. Our engineers will be happy to study your specific requirements and make the correct recommendations *at no cost to your company.*

Remember, Holtite Nylok Screws and Bolts give you these advantages:

1. Positive locking
2. One piece; eliminates separate auxiliary parts
3. Readily replaced
4. Interchangeable
5. Re-usable
6. Locks seated or unseated
7. Defies vibration
8. No harm to mating threads of parts
9. Acts as a seal for gases and liquids under high pressures
10. Locks where it stops

It will pay you to talk over your fastener problems with the Continental Engineers.

Only Continental Engineers Are Required To Have This Training

Each engineer at Continental is required to undergo thorough experience producing ground thread taps and gages, with their exacting screw thread dimensions. This special training is passed on to you—at no extra cost.

CONTINENTAL SCREW COMPANY INC. 1904

—You can count on Continental.

Continental Screw Co.

Manufacturers of Holtite Fastenings

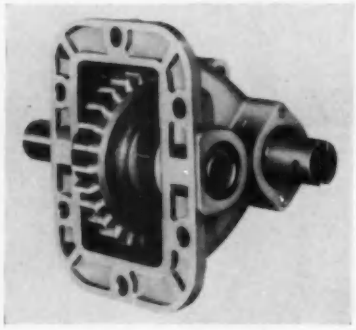
New Bedford, Massachusetts, U.S.A.

NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Power Take-Offs

Designated Series 22, the addition of a new line of single speed, single gear truck power take-offs for medium duty operation has been revealed. Manufactured in nine different models



to accommodate all popular transmissions, the entire series offers die-cast aluminum housings for lightness and strength; three optional output shaft sizes, with shafts rotating on needle bearings; hardened shaved gears that mesh with transmission only while take-off is operating; and optional cable or lever control. They can be furnished in any one of four assemblies. *Tulsa Winch Div., Vickers Inc.*

Circle 60 on postcard for more data

Flame-Cut Alloy Plate

Flats, rings, discs and irregular shapes, flame-cut from E8615 alloy steel plate, are now available. The case hardening steel plate is stocked in 72 in. by 240 in. size, in thicknesses from ½ in. to 6 in. inclusive, the announcement stated. Cutting to shape is done with electric-eye-controlled single and multiple-torch burning machines that produce blanks and parts to sketch.

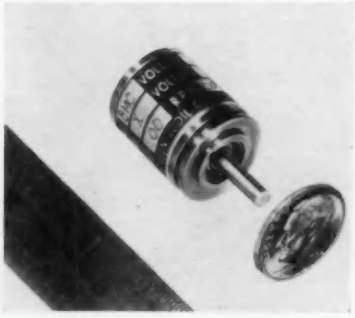
Advantages of a carburized and hardened plate of this analysis, a chrome - nickel - molybdenum electric furnace alloy, over ordinary low carbon steel plate carburized and hardened, are said to be: greater strength, more uniform wear resistance, case depth and hardness, higher core properties, more reliable heat treatment response and less distortion. Representative applications include racks, bushings, gears, cams, fixtures, gages, molds, ways, jigs, chuck jaws, and die bases. *Joseph T. Ryerson & Son, Inc.*

Circle 61 on postcard for more data

Small Servo Units

A size 8 servo motor and motor driven induction generator, said to be the smallest produced for practical application, have been announced. Only ¾ in. in diameter, these units exhibit characteristics comparable to the larger size 9 models, it is claimed. One of the main advantages of the new size 8 is that despite their small size they can still be wound for standard voltages and push-pull application.

The control motor operates on 26 to 52 v, 400 cycles, at a free speed of 7600 rpm, and has a stall torque of 0.20 in.-oz. Power output is 0.293 w; theoretical acceleration at stall 28,000

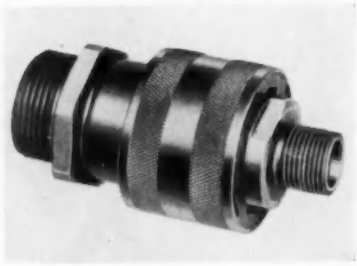


rad/sec/sec; power input per phase at stall 1.7 w; motor length 0.953 in. The generator delivers 0.3 v at 1000 rpm, 0.020 v at zero rpm. Power input is 1.8 w; and generator length is 1.953 in. Both motor and generator may be wound for any voltage from 26 to 52. *Transicoil Corp.*

Circle 62 on postcard for more data

Self-Sealing Coupling

Introduction of a fast-acting, self-sealing hydraulic coupling that locks with a simple push, is announced. There is no intermediate, or partially



locked position. It couples against 60 psi in both coupling halves without twisting, turning or special tools. A pull on the coupling effects immediate disconnection and positive seal for each half, yet high acceleration and impact loads will reportedly not cause accidental uncoupling.

The new disconnect is said to outperform present and proposed tests for air-inclusion, oil loss and pressure drop. The operating sleeve stays in fully assembled position even when subjected to repeated accelerations of 35 g. The locking device and sealing elements are located internally, avoiding damage from bumping. It is equipped with standard fittings and bulkhead flange. Standard AN and MS O-rings and back-up rings are used. *The Weatherhead Co.*

Circle 63 on postcard for more data

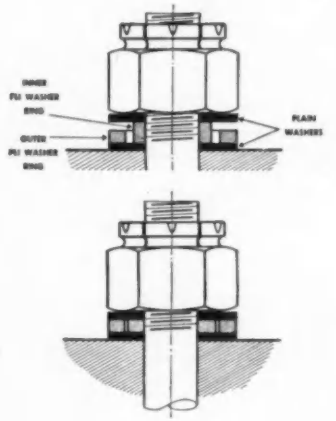
LP-Gas Carburetors

Now being produced is a new line of LP-gas carburetors, all with replaceable venturis and with throttle optional on either side of carburetor. They may be used as updraft, downdraft or sidedraft. Most models have various horn sizes available and all models have two dry-gas inlet connections and built-in power adjusting screws. *Beam Products Mfg. Co.*

Circle 64 on postcard for more data

Preload Washer

The PLI (preload indicating) washer is said to offer a simple and accurate means of measuring the clamping-together forces in a tightened bolt. The unit consists of two concentric steel rings sandwiched between two



close tolerance washers. The inner ring is smaller in diameter and thicker than the outer ring. As the assembly is tightened the inner ring takes the load and is compressed, first elastically, then actually deformed well into the plastic region, until the outer ring is bound between the upper and lower plain washers. This inner ring is designed to have a rather constant resistance to plastic deformation, and the force necessary to compress it, so that the outer ring binds can reportedly be very accurately determined. When binding of the outer ring occurs during assembly, it is a sign that the desired load has been reached. The illustration shows views before and after tightening. *Standard Pressed Steel Co.*

Circle 65 on postcard for more data

Canopy Seals

Inflatable canopy seals made of silicone rubber, now in production, are said to provide room temperature flexibility at —80F, immunity to ozone and weathering deterioration, indefinite shelf life for spares, and a non-stick surface that prevents bonding.

Immunity to ozone deterioration and increased low temperature range are pointed out as the most important features of the new seals. Ozone, encountered in many areas on the ground and in high concentration from 30,000 feet up, causes organic rubber to harden; and organic rubber seals become stiff at —65F, brittle below this, according to the announcement. Flexible at both higher and lower temperatures and unaffected by ozone and weathering, the silicone rubber units will reportedly provide positive sealing of canopies with the same low air pressure over this wider range. *The Connecticut Hard Rubber Co.*

Circle 66 on postcard for more data

Thread-On Caps

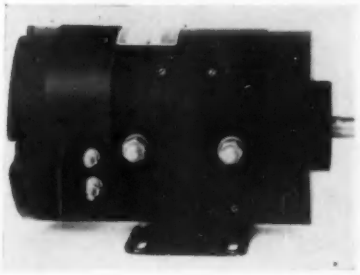
Insulating caps for aircraft wire ends that can be threaded on, have been introduced. Made of nylon, the cap is threaded on unstripped ends of extra and unused pigtail leads with a few finger motions. The threaded cap bites into the wire insulation to form a protective seal that is said to hold under vibration.

Color coding facilitates installation. Selection of the right size for a particular wire end is made on the basis of its color, which indicates the different wire sizes covered by the cap. They are available in sizes for No. 20 to No. 16 wires. *Thomas & Betts Co.*

Circle 67 on postcard for more data

Battery Truck Motor

Developed for industrial electric trucks and small personnel carriers, a new battery truck motor is said to have high starting torque for fast acceleration and uphill operation and



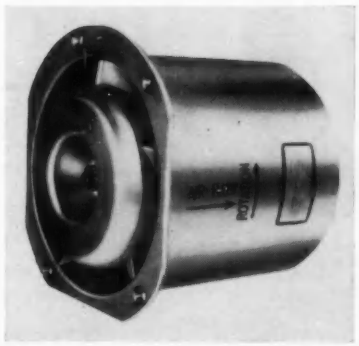
high efficiency resulting in low battery drain. Ratings are one to two horsepower; 12, 24 or 36-v; and from 1000 to 2400 rpm. Designated the BC-48 model, its diameter is 6⅝-in., length 9¼-in., and weight 54-lb.

Optional features include series, shunt or compound construction, flange or base mounting, open or totally enclosed design, and single or double shaft extension. *General Electric Co.*

Circle 68 on postcard for more data

Fan-Blower Unit

A fan-blower unit for airborne application, which compensates for low air density by increasing blower speeds, has just been announced. The unit, BC 2914 F-1, has been designed especially to provide higher cfm rates



at upper altitudes. The blower will provide 8000 rpm, with 210 cfm at two inch back pressure, at sea level. At 60,000 feet, blower speed is increased to 11,000 rpm. This new device has a vane axial fan with a 1/6-hp a-c motor, operating at 115-v, 2.5 amp, 400 cycles. The BC 2914 F-1, also available with d-c motor, features a cast aluminum impeller and housing. *Induction Motors Corp.*

Circle 69 on postcard for more data

Altitude Control

An altitude control mechanism that is said to be so sensitive that it can accurately record a change of altitude as slight as 15 in. at ground level, was recently revealed. At a rarefied 60,000 ft altitude it can reportedly also sense comparatively minute changes of 20 ft. In operation the control senses the variable static pressures and conveys these findings to an automatic pilot for necessary corrections of the aircraft's altitude. According to company engineers, the device also lends itself to development of a highly accurate visual altimeter.

In addition to enabling the autopilot to fly the plane at a constant, given altitude, the new instrument also features a rate of descent control.

Sensitivity of the new control is obtained through a sensory bellows, operated from a fixed position. A change in pressure against the bellows causes it to expand or contract, giving an indication of the change. Pressure is then converted to altitude through the use of a non-circular gear device. *AiResearch Manufacturing Co.*

Circle 70 on postcard for more data

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

Newberg Visualizes Industry On Threshold of Great Growth

While there is some concern over lower car sales this year, the industry in general considers the present lag only a temporary pause in the upward growth of the automobile market. An encouraging example of what lies ahead comes from William C. Newberg, president of Dodge Div.

It is almost certain that sales this year will not come anywhere near last year's record high and, at this stage, no one is making any forecasts for 1957. However, 1960 may see an upsurge which could topple all past records, and an eight-million-a-year car market will be "nothing to shout about," Mr. Newberg asserts.

The year 1955 represented the first "tip-off" on the real size of the market, he notes. The automobile industry is preparing for an expanded market which could likely reach 10 million cars annually by 1965, he further states.

To meet that expanded market, the industry will probably invest between $6 and $7 billion total on capital improvement programs in the next five years, Mr. Newberg estimates. That is equivalent to the total amount spent by the industry during the 10 years since the end of World War II.

There are factors contributing to the industry's continued optimism, in addition to the population growth at the rate of nearly three million persons a year. Recent studies show that the number of multiple-car families between August, 1953, and August, 1955, increased by more than 70 per cent.

Automobile scrappage, which hit a record four million last year, will continue upward, Mr. Newberg predicts. He estimates that the number of cars which will be junked annually within the next decade will increase to about five million.

New Truck Brake Regulations To Be Put in Effect by ICC

Starting with an initial effective date of June 30, 1956, a series of new brake regulations are being put into force by the Interstate Commerce Commission. The new rules represent for the most part modifications of the proposals promulgated by ICC the early part of this year (see AI, Jan. 1, p. 60). Revisions were made in the original proposals after hearings at which various interested parties presented their viewpoints.

In a nutshell, the new Interstate Commerce Commission brake regulations require:

1. Automatic application of brakes on towed vehicle in event of breakaway that will hold for at least 15 min (effective June 30, 1956).

2. "No-bleed-back" emergency valve or equivalent to prevent backflow of air from reservoir on towing vehicle made after Aug. 31, 1956.

3. Service brakes on towing vehicle capable of stopping vehicle in event of breakaway (effective Jan. 1, 1957).

4. Two controls on air brake-equipped towing vehicle made after Aug. 31, 1956, for application of towed vehicle emergency brakes; one to provide automatic application when air pressure is at least 20 psi, but not more than 45 psi, and the other for manual application by driver that does not interfere with automatic control (effective Jan. 1, 1957).

5. Second control on vacuum brake-equipped vehicle to operate towed vehicle brakes in an emergency (effective Jan. 1, 1957).

6. Reserve capacity on air or vacuum brake-equipped truck, tractor or bus made after June 30, 1953, sufficient to stop vehicle within prescribed limits if engine stops. (Does not apply to single vehicle where service brakes are applied by hydraulic or mechanical means if air or vacuum fails.)

7. Check valve to safeguard such reserve capacity on towing vehicle regardless of date of manufacture (effective June 30, 1956).

8. Audible or visible driver warning signal (other than gages indicating pressure or vacuum) to indicate lack of air or vacuum sufficient to stop vehicle on air brake-equipped truck, tractor or bus (effective June 30, 1956) or on vacuum brake-equipped towing vehicle (effective Jan. 1, 1957).

(*Turn to page* 178, *please*)

MARCH SALES WAY UP OVER FEBRUARY BUT QUARTER DOWN SOMEWHAT OVER '55

Regional Sales of New Passenger Cars

Zone	Region	March 1956	February 1956	March 1955	Three Months 1956	Three Months 1955	Per Cent Change: Mar. over February	Per Cent Change: Mar. over Mar. 1955	Per Cent Change: Three Months 1956 over 1955
1	New England	26,776	26,115	34,191	75,025	84,061	+ 2.53	−21.69	−10.77
2	Middle Atlantic	103,350	70,644	132,861	233,857	294,177	+46.30	−22.21	−20.50
3	South Atlantic	64,695	58,363	75,085	185,304	200,229	+10.85	−13.84	− 7.45
4	East North Central	141,370	115,665	167,589	372,139	401,968	+22.22	−15.64	− 7.43
5	East South Central	30,659	25,850	33,004	77,618	79,596	+18.60	− 7.11	− 2.49
6	West North Central	46,095	41,179	58,858	124,520	142,080	+11.94	−21.68	−12.36
7	West South Central	50,525	48,785	42,030	138,910	123,210	+ 3.57	+20.21	+12.74
8	Mountain	18,246	14,393	18,197	46,197	44,380	+26.77	+ .27	+ 4.09
9	Pacific	63,518	46,548	74,719	170,854	182,994	+36.46	−14.99	− 6.63
	Total—United States	545,234	447,842	638,534	1,424,424	1,552,735	+21.83	−14.34	− 8.26

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash.

The ring of quality

Colorful, low-cost sidewall rings that can be quickly installed on tires are now contributing to the luxury-look of today's new cars. They're inexpensive, stay brilliant for life, wash bright in seconds, out-last tires. A product of The Bearfoot Sole Co., Wadsworth, Ohio, these rings are available in a variety of colors or in white. They're made of Enjay Butyl Rubber because no other rubber tested could equal its performance in severe laboratory and road tests. The Enjay Butyl label on the Flex-A-Wall ® carton assures the buyer of outstanding quality.

Find out for yourself the many technical advantages of Enjay Butyl—the rubber that is outperforming natural and other types of rubber in a wide variety of industrial and consumer applications. For full information, and for technical assistance in the use of Enjay Butyl, write, wire or phone the Enjay Company.

ENJAY BUTYL

ENJAY *Pioneer in Petrochemicals*

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.

Other offices: Akron • Boston • Chicago • Los Angeles • Tulsa

Enjay Butyl is the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

AIR BRIEFS

By RALPH H. McCLARREN

U. S. Airpower Makes Big Gains

During the past five years, the combat strength of U. S. airpower has increased 160 per cent and its capabilities have been immeasurably strengthened. Other significant achievements of the aircraft industry are equally impressive, according to a review reported by the Aircraft Industries Association.

In 1950, the aircraft industry produced 215 planes a month (most of them piston-engine-powered) and employed about 206,000 persons. During 1955, however, approximately 751,000 persons were employed, and plane output more than doubled. The industry now occupies 131.3 million sq ft of floor space, compared with 63.5 million sq ft in 1950.

Performances of aircraft have soared with speeds two to three times up from those of 1950. One production fighter—the Lockheed F-105—can go twice the speed of sound. The loads the new jets carry are much greater than those which the 1950 piston-engined types could lift. Perfection of in-flight refueling has greatly expanded the operational distance limits of military aircraft.

Analog Computer "Flies" Jets

A giant computing machine that could save up to two years in the costly development of advanced design jet engines has been built for the Air Research Development Command by General Electric Co. One of the largest ever built, this unique analog computer will enable engineers to "fly" jet engines before they are built and to forecast performance characteristics of control systems for jet engines that are still on the drawing boards.

The computer, which took six years to build, covers a floor area of 2635 sq ft, measures 35 by 100 ft installed, and is 12 ft high. Forty tons of air conditioning are required to keep it cool and insure accuracy of operation. It contains 6000 vacuum tubes, 140,000 ft of wire, 1700 indicator lights, and required 85,310 manhours to design and build.

Assets of Titanium Hailed

According to S. R. Carpenter, supervisor of producibility for Convair (San Diego) Div. of General Dynamics Corp., titanium appears to be one of the most useful metals for aircraft construction from the standpoint of aerodynamic heating occurring at high Mach numbers. This is because it has a high strength-weight ratio at temperatures up to 600-800 F, depending on the alloy.

Mr. Carpenter, who delivered a paper at the recent spring meeting of the American Society of Mechanical Engineers, analyzed the benefits of titanium with respect to its strength-weight properties, heat-treat considerations, fatigue characteristics, and shop forming methods for aircraft.

Guided Missile Plant Planned

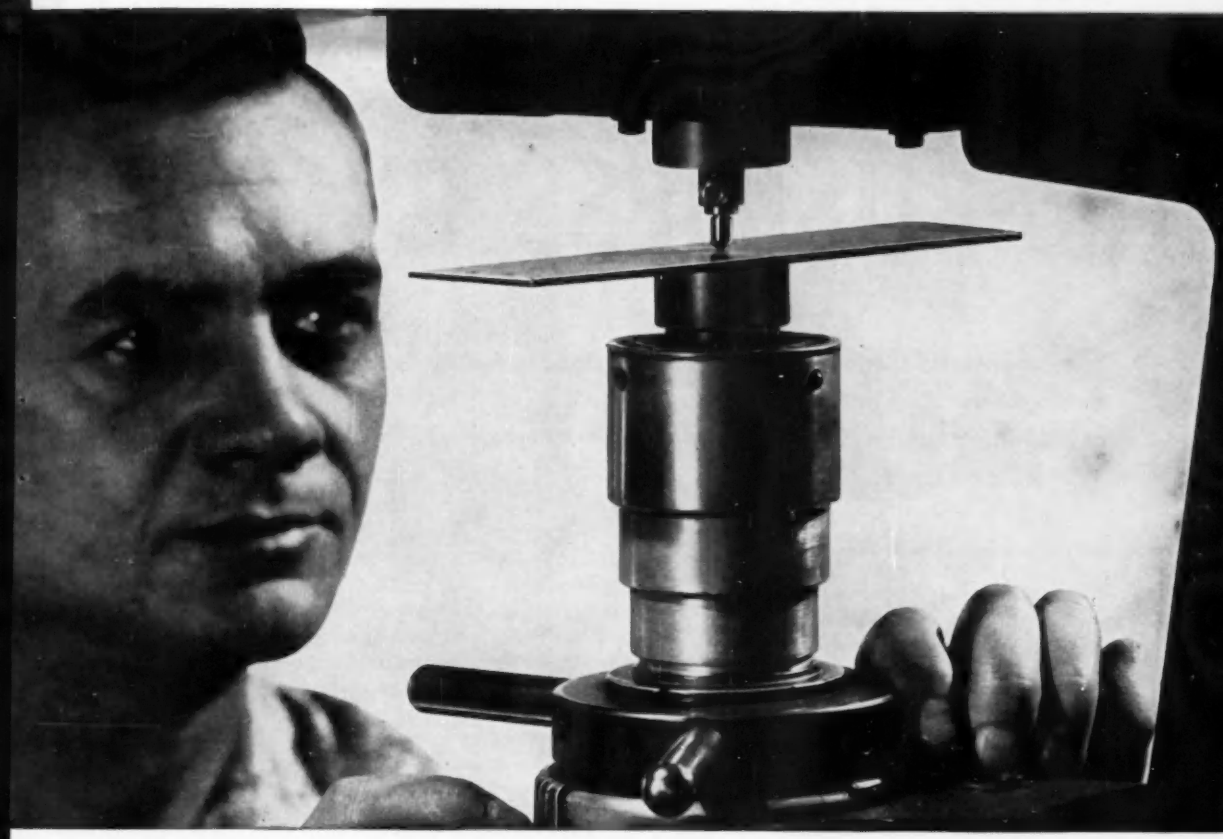
The Secretary of the Air Force announced on May 2 that Convair Div. of the General Dynamics Corp. will construct a new facility at Sorrento, Calif., to be used for development and production of a guided missile system. This site was selected because of its proximity to the Air Force Test Site at Sycamore Canyon and remote enough from other San Diego defense activities to meet technical and strategic requirements.

The site involves approximately 280 acres of land, and buildings will involve approximately one million sq ft of floor space. It is estimated that this facility will employ as many as 6000 persons by 1958. Construction of facilities and equipment will cost approximately $40 million.

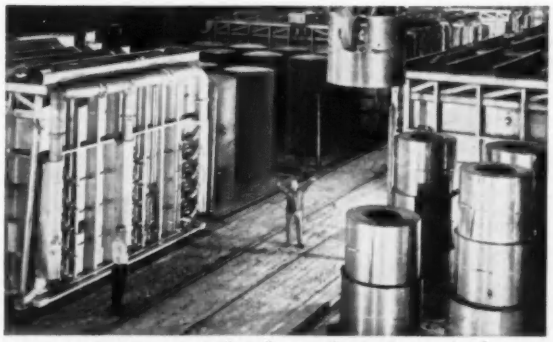
Helicopter Cuts Traffic Jams

The multi-engine transport helicopter promises to become one of the most important tools in the alleviation of traffic congestion in the nation's densely populated areas. Such was the prediction of Don R. Berlin, chairman of the Helicopter Council of the Aircraft Industries Association and president of Vertol Aircraft Corp., in an address presented recently to members of the Airport Operators Council.

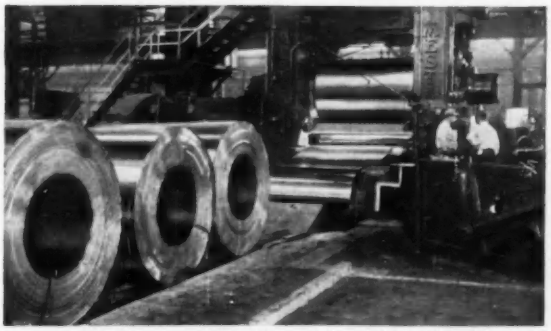
(*Turn to page* 118, *please*)



How Great Lakes Steel *puts the pressure* on quality



COILS ARE ANNEALED in these giant ovens to impart maximum softness and ductility. And then . . .



COILS ARE TEMPER ROLLED in a skin mill to give the stiffness, surface and flatness which have been specified by the customer for the order.

Right on the nose—not too hard, not too soft! This steel coil passes the Rockwell Test with tolerance to spare.

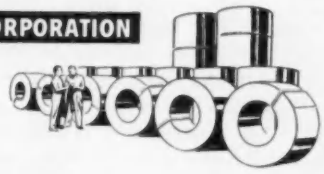
In the Rockwell, or hardness test, pressure is put on a sample piece of coil by a system of loads applied through a tiny ball. A needle gauge signals the depth of the impression. From this, our test engineers can readily tell: (1) if the coil was annealed to maximum softness for extra-deep drawing; and (2) if it is now properly tempered to meet customer specifications.

Quality control every step of the way—yes, that's our most important job at Great Lakes. Reason enough to call us and talk over your steel needs?

GREAT LAKES STEEL CORPORATION

Ecorse, Detroit 29, Michigan • A Unit of

NATIONAL STEEL CORPORATION



District Sales Offices: Boston, Chicago, Cincinnati, Cleveland, Grand Rapids, Houston, Indianapolis, Lansing, Los Angeles, New York City, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Toledo, Toronto.

The BUSINESS PULSE

Static Business Situation of Recent Months Has Tended to Render Businessmen Hypersensitive to Market Developments. Capital Investment Plans Seen as Stabilizing Factor. Government Buying Unchanged. Retail Sales Fall Off.

This Survey Is Prepared exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York.

Business Test Looms

Business optimism appears to have ebbed a bit in recent weeks. At least this is what is suggested by transactions on the stock exchanges and the increasingly conservative tone of most comment on the near-term outlook. While it would be an exaggeration to say that businessmen are alarmed, it is a fact that they are beginning to think of and talk about a new cyclical downturn as a very real possibility.

The additional cutbacks which were made during May in automobile production and employment certainly helped to bring about this turn of events, since they showed very clearly that the recessionary tendencies in that important industry had not run their course, as some analysts had believed. Reports of emerging inventory problems in other consumer-goods areas, such as the appliance field, probably also caused confidence to weaken. Likewise, information from purchasing agents that the flow of new orders to manufacturers in general may have begun to wane could well have been contributory. Other factors may have been the continued sluggishness in such fields as residential building and farm-machinery production and perhaps also the growing realization that some moderation of tempo is likely in the steel industry once the current phase of hedge buying has passed.

It is impossible to judge the relative importance of these factors as explanations of the decline in confidence, or for that matter even to be sure that the principal cause wasn't something entirely different from those listed above. Whatever the reasons, however, the significant thing for the present is that confidence has in fact weakened. Not even the extremely bullish McGraw-Hill report on capital-spending plans for 1956, which was released at mid-May, seemed in any way to stem the deterioration, whereas two months earlier a similarly bullish Government report on such spending had a rather galvanic impact on confidence.

It is entirely possible, of course, that the ebbing of confidence which appears to have occurred may not be fully warranted by actual business conditions and prospects. It has to be recognized that the static business situation of recent months has naturally tended to breed uneasiness and specifically has tended to render businessmen hypersensitive to market developments. This background makes it conceivable that many businessmen have read too much into the most recent none-too-favorable market reports and that the realization that they have done so will shortly bring about a recovery of some of the lost confidence. There is no mistaking the fact that actual business is still at an extremely high absolute level, and it is by no means clear that recessionary influences have gained sufficiently in strength and generality to cause a downturn as yet in the curve of aggregate activity. As of now the continuing divergent tendencies in general business preclude any firm judgment as to the outlook. However, it is becoming fairly obvious that a test of the essential soundness of business is not far off (most analysts seem to think it will come in the third quarter), and it is also reasonably clear in what sectors of the economy the outcome is likely to be determined.

GNP Breakdown

In this latter regard, data on gross national product for the first quarter of the year, supplemented by more recent monthly and weekly information, provide a good frame of reference.

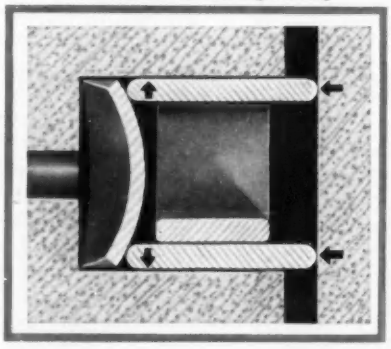
GNP data show, first of all, that for all practical purposes the economy had ceased its uptrend by the first quarter. The seasonally adjusted annual rate of GNP was slightly higher in dollar terms than in the final quarter of 1955, but if allowance were to be made for price increases between the two periods, it would be possible to make a plausible case for an actual decline.

More significant as a guide to future possibilities than the near-stability of aggregate GNP were the movements of particular components.

Personal consumption expenditures, which consti-

(*Turn to page* 120, *please*)

New CS-50U Side-Sealing Oil Ring



WHEN HIGH VACUUM ON DECELERATION CREATES AN OIL-WASTE PROBLEM . . .

Sealed Power has the answer!

Many modern engines tend to create a high vacuum on deceleration, permitting oil to escape past the oil rings. To correct this condition, Sealed Power engineers have developed a special oil ring. The new Sealed Power CS-50U ring has a crowned spring which *forces* side rails snugly against the sides of the ring groove, preventing excessive by-passing of oil.

Both side rails have solid chrome faces for long ring life, and the design of the new steel spacer assures resistance to sludging, with a full flow of oil at all times. Easy installation keeps assembly costs low.

The new Sealed Power CS-50U is already in use as original equipment, and is ideal for replacement use.

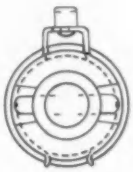
SEALED POWER CORPORATION • MUSKEGON, MICHIGAN • ST. JOHNS, MICHIGAN • ROCHESTER, INDIANA • STRATFORD, ONTARIO
DETROIT OFFICE • 7-236 GENERAL MOTORS BUILDING—PHONE TRINITY 1-3440

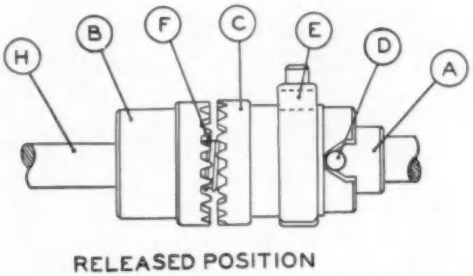
Sealed Power Piston Rings

PISTONS • CYLINDER SLEEVES

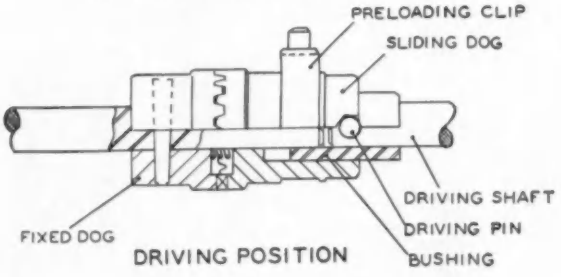
Leading Manufacturer of Automotive and Industrial Piston Rings Since 1911
Largest Producers of Sealing Rings for Automatic Transmissions and Power Steering Units

Tractamatic Drive in and out of engagement. A—Driving shaft, B—Fixed dog, C—Sliding dog, D—Driving pin, E—Spring, clip, F—Light coil spring, H—Driven shaft.



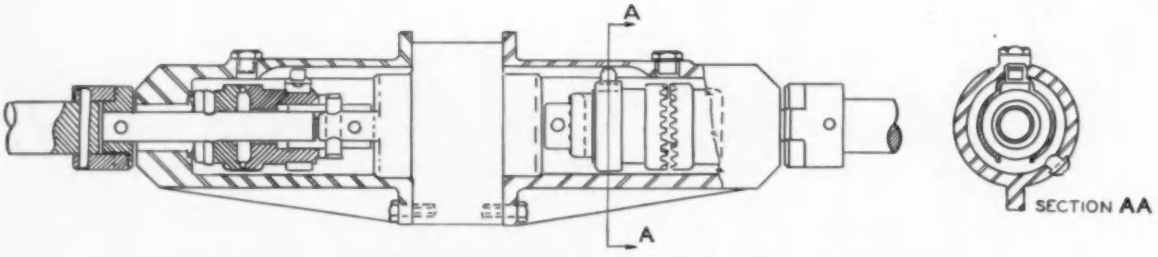


RELEASED POSITION



DRIVING POSITION

Simplified Differential
Prevents Wheel Spin



Arrangement of dog clutches, etc., in the Tractamatic drive unit

A SIMPLE torque transmission unit, designed to replace a conventional differential in certain applications, has been produced in Britain by Watson-Oswin Ltd. The Tractamatic is claimed to be a fully reversible self-engaging and disengaging drive, which permits overrunning by one axle shaft in either direction.

Power is always maintained on the inside wheel during cornering, with the outside wheel coasting through the longer path. Should the driven wheel lose traction and spin, the other wheel is automatically engaged.

The unit consists of a central worm or bevel gear carrying a shaft terminated at each end by a sliding dog clutch, lightly spring-loaded so as to be in a retracted position when stationary. A V-slot in its inside collar is engaged by a pin in the drive shaft which thrusts the dog outward when rotated. A weak friction clip prevents the dog from turning during this lateral movement. The sliding member then meshes with the fixed dog on the inner end of the axle shaft.

An overrunning wheel will disengage its own drive by speeding up its sliding dog, causing the leading side of the V-slot to move away from the pin. Braked by the friction clip, the sliding dog is then pushed out of mesh by the coil spring. Re-engagement takes place when the two speeds are again synchronized. The same functioning occurs with reverse rotation.

The Tractamatic is stated to be well suited for front-wheel drive in four-wheel-drive vehicles, since the sliding dogs retract completely when power input is removed, thus avoiding the drag of an idling differential when only the rear wheels are driven. Other applications include industrial trucks, farm machinery, and conveyor systems. The unit runs in an oil bath, and is housed in a casing little more than three times the diameter of the shaft.

• • •

$100,000 Give-Away Contest Begun By Plymouth Dealers

Automobile companies continue to pour out prize money lavishly in an attempt to attract potential customers into dealer showrooms. Plymouth now is sponsoring a contest offering 446 awards valued at a total of $100,000, including a $50,000 grand prize.

The contest is called "The Solid Gold License Plate Jackpot." All a contestant needs to do is visit a dealer's showroom, produce proof that he owns a car, and fill in an entry blank.

Acme · RYDER

MULTIPLE-SPINDLE *Vertical Chucker*

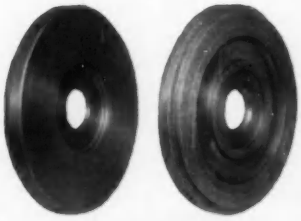
JOB FACTS

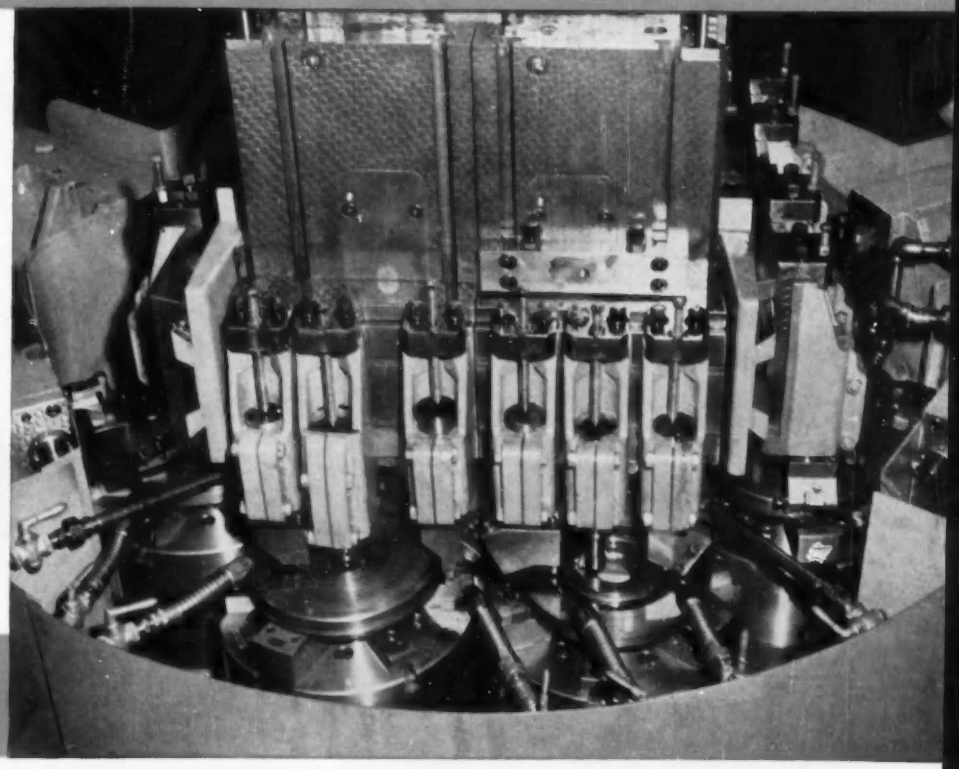
Piece: Cast Iron Flywheel (casting 1-1/2″ x 11-3/16″ dia.)

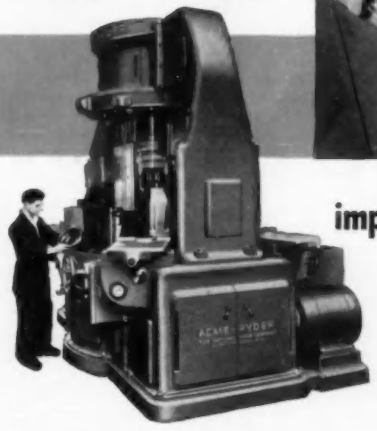
Operations: 26—Machine arranged for double indexing complete both sides of the piece, in one machine setup (10 to rough and finish Machine first side, 16 for second), using carbide tooling throughout.

Machine Time: 43 seconds.

Machine: Acme-Ryder 14″ Eight-Spindle Vertical Chucker.







Do your present machining methods meet Acme-Ryder standards? Our sales engineer can help you make comparisons—or provide a demonstration at your convenience.

improves machining efficiency on large forgings and castings

Arranged for double indexing, the Acme-Ryder 14″ Vertical Chucker completes both sides of this 11-inch cast iron flywheel simultaneously in 43 seconds total machine time.

Four independently operated cross slides, an exclusive Acme-Ryder feature heretofore unavailable on this type of machine, provide greater tooling flexibility—let you perform more secondary operations in the primary machining setup.

In addition, this new vertical chucker has ample power to take the heaviest cuts with carbide tooling while maintaining fourth-place decimal point accuracy. AND, it provides a generous reserve to accommodate future tooling developments.

National Acme

THE NATIONAL ACME COMPANY, 173 EAST 131ST STREET, CLEVELAND 8, OHIO

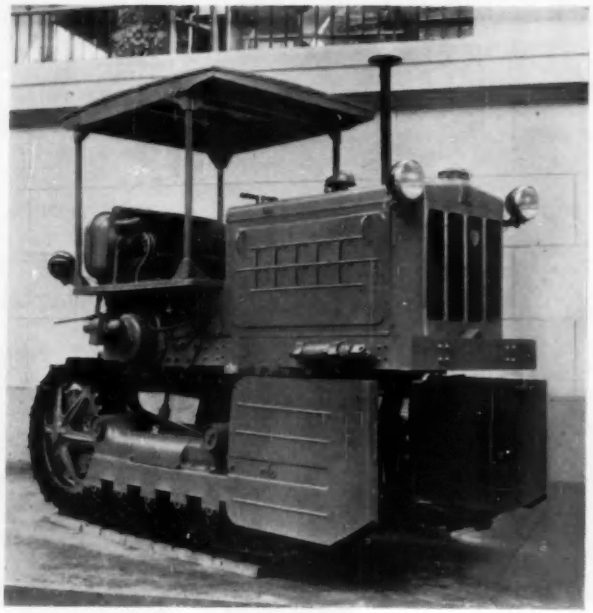
SALES OFFICES: • Newark 2, New Jersey • Chicago 6, Illinois • Detroit 27, Michigan

Wide-track crawler, powered by a 100 hp Diesel, is designed for marshland and peat bog work. The 3-ft shoes give a ground pressure of 4 psi, and drawbar pull in first gear is 15,000 lb. Intended for creeping and low-speed running up to 2.5 mph, this machine is geared for only two forward and two reverse ratios.

RUSSIA'S LATEST TRACTORS

The low-powered DT-14 has a single-cylinder Diesel developing 14 hp at 1600 rpm. Starting is by gasoline at a lower compression ratio. Ground clearance can be changed by reversing the stub axle brackets and reduction gear housings at the rear. Tread is also variable. The seat can be placed ahead of the steering column to face rearwards, and the steering wheel repositioned on an auxiliary pinion to maintain normal turning sense.

This electric machine is developed from the 37 hp Byelorus with an electric motor replacing the Diesel engine. Power is obtained from a sub-station adjacent to the field, and the drum, mounted on the chassis, reels cable in or out as the tractor moves. Overhead pulleys keep the wire clear of the wheels and implements.



Row-crop crawler for cotton cultivation has 8-in. tracks spaced 53 in. between centers, and a ground clearance of 32 in. The four-cylinder Diesel engine develops 37 hp at 1400 rpm, and drive is through a five-speed gearbox. A shaft pto is at the side.

Any steel bar you need . . .

STAINLESS · ALLOY · COLD FINISHED

Keeping a big stock of steel bars in various types, grades and sizes—in stainless, alloy and cold finished steels is a mighty big expense. *And,* there's no need for it. All U.S. Steel Supply warehouses, located from coast to coast, carry a complete line of bars ready and waiting for your call. When you order steel from us, you get it fast—without delay. Why not make our warehouse your warehouse and let us carry the expense of big inventory.

U.S. Steel Supply warehouses also carry big stocks of sheet, strip, plate, shapes, tubular products, bars, expanded metal, etc.—in stainless, and carbon and alloy steels. One order can cover all your steel requirements—and we will be glad to help you select the best steel for the job. Call your local U.S. Steel Supply salesman.

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DIVISION

General Offices: **208 So. La Salle St., Chicago 4, Ill.** USS **Warehouses and Sales Offices Coast to Coast**

UNITED STATES STEEL

Automatic wire programming machine built at El Segundo Div. of Douglas Aircraft Co.

Wire Programming Machine Can Operate at 100 FPM

CUTTING and identifying of wire is handled more economically by an automatic wire programming machine now in use by Douglas Aircraft Co.

Designed and built by the Torrance facility of the company's El Segundo division, the machine reduces costs of processing more than four miles of wiring that goes into each F4D Skyray.

It measures, cuts, stamps and strips the ends in one continuous operation at the rate of 40 fpm, a job formerly performed manually at only 8 fpm.

The new machine has a maximum potential of 100 fpm and is accurate to one-quarter inch in 100 ft lengths. The operation is necessarily slowed when working in shorter lengths.

Standard commercial parts go into its makeup, including the following five major components: a Kingsley Wire Stamper which was altered to stamp both sides of the wire simultaneously by using two type slugs with the number identification; a slack take-up unit on the stamper to allow for a continuous flow of wire; a variable speed drive unit and clutch which pulls the wire through the machine; an electronic decade counter which actually feeds instructions into the machine by programming and counting the wire lengths and turning off the machine after the pre-set number of wires have passed through, and a Mark I stripper unit was altered for automatic operation.

• • •

Car Dealers Pushing New Bill In Congress

With Congress scheduled to adjourn next month, chances for any action on a new bill introduced by the National Automobile Dealers Association last month (May) appear slim. The last-minute bill is a revamped version of three previous ones which have been pushed by the dealers since Congress convened this year. Although it eliminates certain proposals made earlier, to which car makers and the Government objected, it contains several new provisos which will undoubtedly meet with stiff opposition.

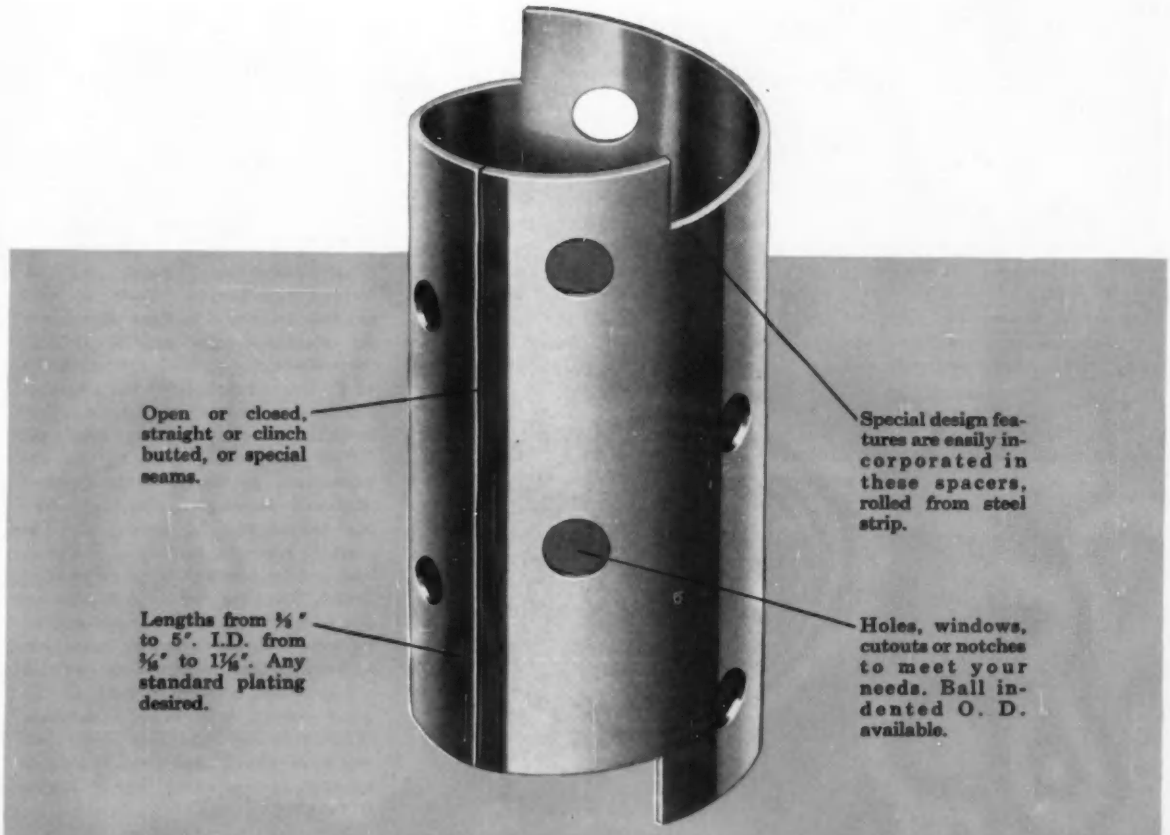
Almost certain to meet objection is a proposal which, in essence, would require the car factory to assume some financial responsibility for service and warranty facilities. It also incorporates a proposal to prevent a car company from forcing any products on the dealer.

Other proposals in the new bill would require the car company to offer to repurchase any excess number of vehicles; make it a violation for a manufacturer to cancel a dealer's contract for reasons not specified in the contract; and require the manufacturer to work out a plan for liquidating a dealer's assets upon contract termination.

ASBE Technical Sessions Scheduled For Oct. 17-19

The dates of October 17-19 have been set for the 11th annual technical convention of the American Society of Body Engineers. This year's sessions, to be held in the Rackham Memorial Building in Detroit, will cover hinging and sealing problems on four-door hardtops, a look at structures of foreign cars, new safety ideas, and gas turbine cars.

As in the past, a mechanical drawing contest will be sponsored for high school students. Particular stress will be placed on the current shortage of body engineers.


Open or closed, straight or clinch butted, or special seams.
Lengths from ⅛" to 5". I.D. from ⅛" to 1⅜". Any standard plating desired.
Special design features are easily incorporated in these spacers, rolled from steel strip.
Holes, windows, cutouts or notches to meet your needs. Ball indented O. D. available.

Rolled Split Steel Spacer Tubes

Infinite Design Variations . . . for a Multitude of Industrial Jobs!

Delivered ready for assembly—no costly cut-off or de-burring. Save the cost of pipe or tubing. No scrap or material handling or inventory! You can save purchasing time, too—645 standard lengths, diameters and gauges. Special designs available. Send for free catalog and price list.

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DIVISION, Federal-Mogul-Bower Bearings, Inc.
11037 Shoemaker, Detroit 13, Michigan

BEARING-SURFACED THRUST WASHERS

BABBITT-LINED BEARINGS

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COPPER-LEAD BEARINGS

FEDERAL Mogul
SINCE 1899

RESEARCH • DESIGN • METALLURGY • PRECISION MANUFACTURING

Gasoline Engine Starter for Diesel Engines

(*Continued from page* 65)

engines by the cooling medium. The exhaust heat of the starter engine can be used to heat the intake air of the Diesel engine. The starter engine is run until the cylinder-wall temperature of the Diesel engine is between 80 and 100 deg F; this takes from 10 to 20 minutes in cold weather. At these temperatures the viscosity of the oil films and the breakaway torque of the engine are greatly reduced and as a result, starting conditions are improved.

By means of the control lever the starter pinion is now shifted into mesh with the starter gear, and a slight continued motion of the same lever engages the friction clutch. As a result of the load thus imposed on the starter engine, its speed drops and the available torque increases. The starter engine is assisted in overcoming the resisting moment of the Diesel engine by the inertia torque of the starter-engine flywheel. Power consumed by the water brake reduces the available starting torque, but this power decreases as the cube of the starter speed, and amounts to very little at the breakaway speed. "Breakaway" of the Diesel engine occurs at the starter speed at which the starter torque is equal to the sum of the Diesel breakaway torque and the water-brake torque. Tests in cold chambers are said to have shown that the starter engine can be reliably started at temperatures down to minus 40 F. One advantage of the gasoline-engine starter over the electric is that starting attempts can be continued almost indefinitely. Owing to the kinetic energy stored in the flywheel of the starter engine, very high starting torque can be developed. The starting torque is limited by the overload or slip coupling, which is a safety device. The delay of 10 to 20 minutes due to warming up the Diesel engine, referred to in the foregoing, may seem to be a rather serious disadvantage, but it should be pointed out that this delay occurs only in cold weather. When starting the Diesel under normal atmospheric conditions, it may be cranked as soon as the starter engine is running.

The three upper curves in Fig. 2 show the variation of starter-engine power, water-brake power, and starter-engine torque with starter-engine speed; the three lower curves show the variation of required cranking torque, available cranking torque, and Diesel-engine speed with cranking-engine speed.

By installing an oil pump driven by the starter engine, it is possible to force warm oil through the bearings of the Diesel engine, thereby further reducing the breakaway torque. Another possibility consists in driving the lighting generator of a vehicle through overrunning clutches from either the Diesel or the starter engine. In that case the vehicle lights could be used without running the Diesel engine. The main engine, moreover, can be kept idling at very low speeds by means of the starter engine, thus reducing the fuel consumption during idling periods.

MAXIMUM PERFORMANCE
MINIMUM MAINTENANCE

Through advanced design and creative engineering, BORG & BECK has stepped up the capacity of its passenger car clutches without increasing their over-all dimensions. Compact, light in weight, precision built—for maximum performance, minimum maintenance.

for that vital spot *where power takes hold of the load*

BORG & BECK CLUTCH THE STANDARD Reg. U.S. Pat. Off.

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Is your News Magazine of Automotive and Aviation
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on this 1941 model
the stainless steel
trim is

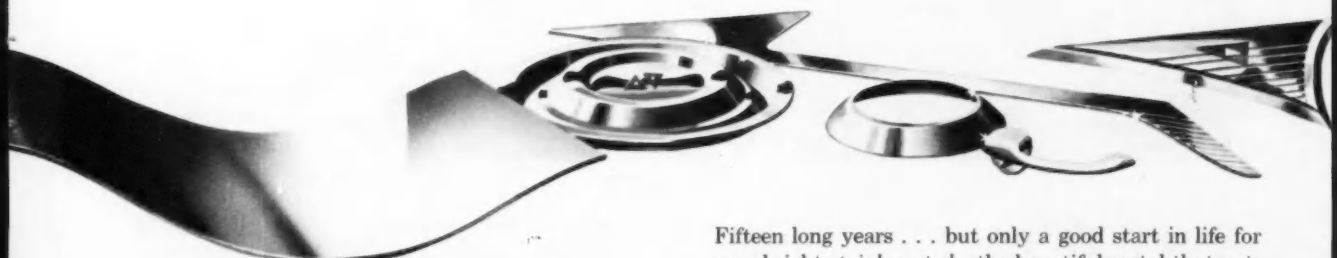
still bright and handsome!

after 15 years
of continual use
and exposure

The photographs of the car are unretouched

yes- Stainless Steel

serves best on any automobile!



Fifteen long years . . . but only a good start in life for ever-bright *stainless steel*—the beautiful metal that outlasts the car! • Today's automotive stylists specify stainless for its *service-proved* strength and corrosion-proof brilliance, and a substantial portion of the industry's orders for stainless calls for coils of SUPERIOR Stainless Strip Steel—precision made, uniform in every desired composition, temper and finish.

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THIS aluminum compressor wheel is the heart of a new turbo-supercharger designed to increase engine horsepower up to 60%. Osborn power brushing methods remove all machining burrs from this compressor wheel . . . maintain a finish tolerance of two ten-thousandths of an inch. In addition to improving the quality of this compressor wheel, Osborn power brushing cuts finishing time from 12 minutes to 4 minutes per part.

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Yield Strength	23,500	22,700
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Elongation	7.5	7.5

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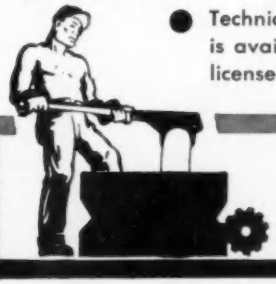

Please send me a copy of the Alloy Data Book giving engineering and metallurgical facts on the physical properties of Frontier "40-E".

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Easy to distribute

Really soak up oil . . .

Always a clean one handy . . .

Just toss 'em in the trash . . .

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. . . this one cost less than ½¢

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Truck bodies demand many hidden qualities to withstand the severe demands of day-in, day-out deliveries—qualities like basic strength in the steel itself, strength in the die-formed members, strength in the design and fabrication of the body.

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What you are really selling, of course, is the ability of your plant to meet and better competition. Consequently, in the final analysis it's productive ability that gives your product the competitive edge that brings in the orders.

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If metal stampings play an important part in the manufacture of your product, it will pay you to talk to a Clearing engineer. Together you can work out plans for a modernization program with equipment that will help you offer more for the money in your finished product. Call or write Clearing Machine Corporation, 6499 West 65th Street, Chicago 38, Illinois. Hamilton Plant, Hamilton, Ohio.

Here's a line of Clearing O.B.I. presses that have helped a manufacturer of contract stampings increase sales and profits by stepping up production schedules.

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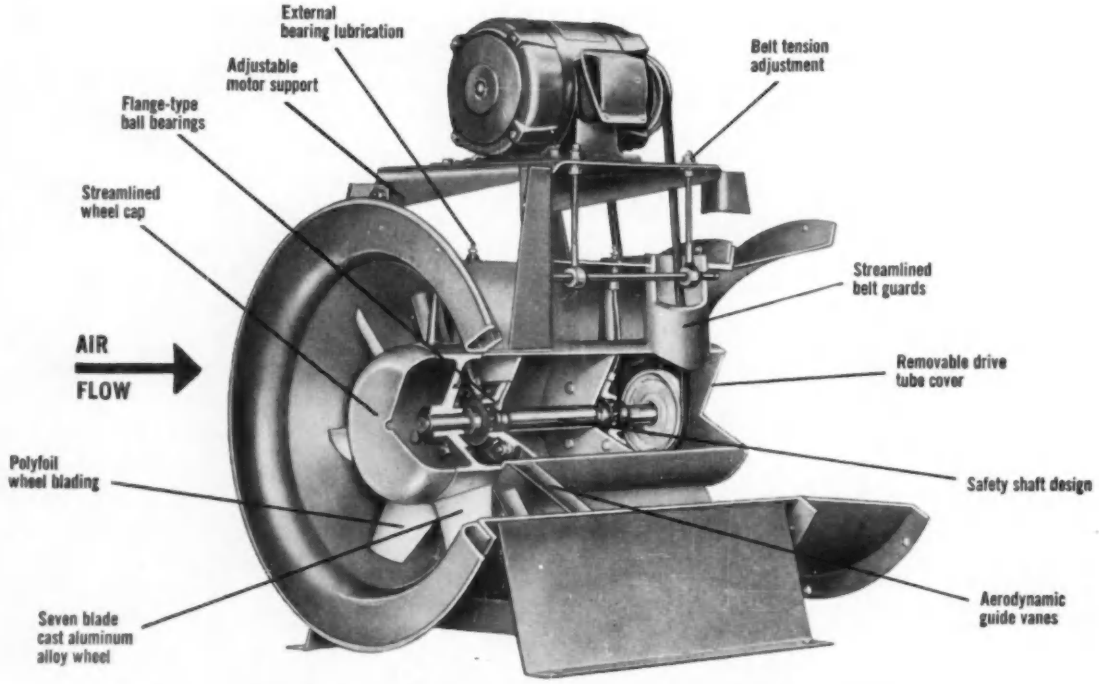

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- **Space Saving** . . . compact Axial Flow design permits installation directly into duct work.
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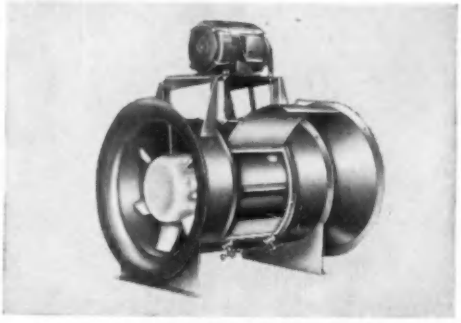
- **Least maintenance** . . . rugged practical construction insures continuous trouble-free operation.

For complete application service, call your nearest Sturtevant Sales Engineer, or write Westinghouse Electric Corporation, Sturtevant Division, Dept. 5F, Hyde Park, Boston 36, Mass.



Spray booth Vaneaxial Fan specially designed to provide easy access required for paint spray exhaust!

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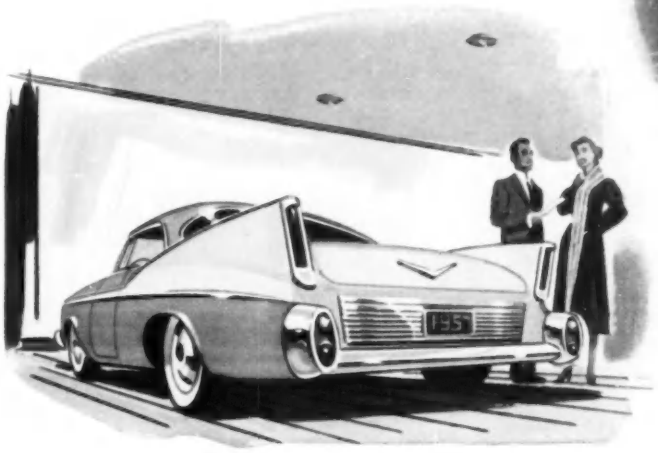
THE MANUFACTURER styles your car with Stainless Steel because it's the readily workable, long lasting metal with beauty and sales appeal.



THE DEALER is proud and confident to offer a product made with Stainless Steel. He knows that nothing compares with Stainless for durability and customer satisfaction.

THE PURCHASER from long experience recognizes Stainless Steel as the easy to clean metal that keeps its shape and good looks under the toughest conditions of driving and weather. Also it's a big plus at trade-in time.

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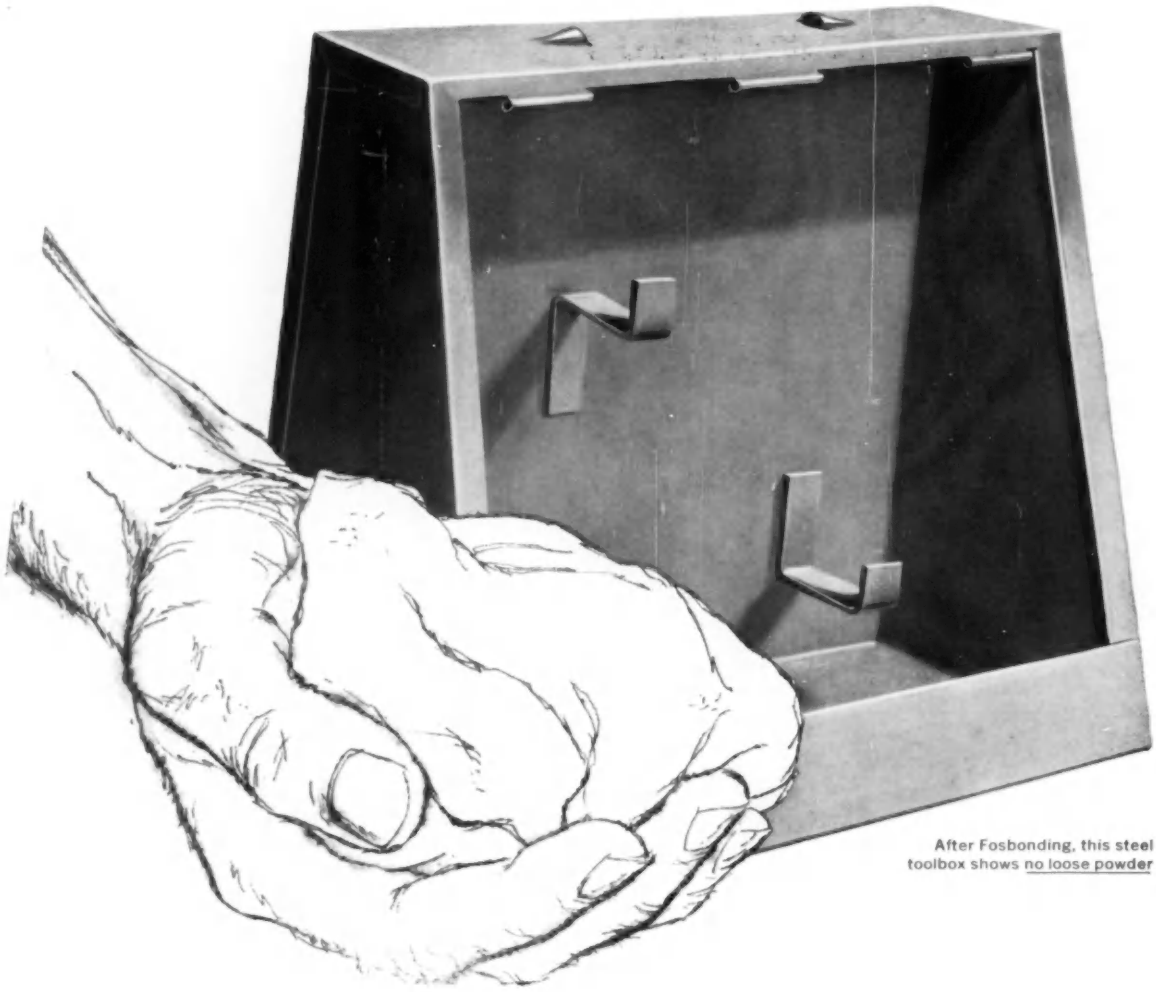
FOR THE PRODUCT YOU MAKE TODAY AND THE PRODUCT YOU PLAN FOR TOMORROW SPECIFY McLOUTH HIGH QUALITY SHEET AND STRIP STAINLESS STEEL

McLOUTH STEEL CORPORATION DETROIT, MICHIGAN • MANUFACTURERS OF STAINLESS AND CARBON STEELS



After Fosbonding, this steel toolbox shows no loose powder

Get powder-free iron phosphate coatings under organic finishes with FOSBOND 22

Here's a truly dependable iron phosphate coating! Fosbond® 22 assures uniform, trouble-free phosphate protection of metal parts, cuts your finishing rejects to the bone. The balanced composition of Fosbond 22 prevents the highs and lows of ordinary phosphate films, and its superior cleaning power lets you clean and coat in one spray bath.

Shipped as a dry powder in a non-returnable drum, Fosbond 22 simplifies your storage and processing all down the line. In addition, long, economical bath life and improved corrosion-resistance under organic finishes help Fosbond 22 pay for itself in re-charge savings and lowered reject rate.

TRY IT IN YOUR CYCLE. See how this inexpensive, easily-controlled phosphate system cuts cleaning and coating costs. Where iron phosphate coating is indicated, you just can't match the simple Fosbond 22 process. Ask your Pennsalt representative for a demonstration in your equipment, or write Metal Processing Dept. 260, Pennsylvania Salt Manufacturing Company, Three Penn Center Plaza, Philadelphia 2, Pa. In Canada: Pennsalt Chemicals of Canada, Hamilton, Ontario.

Pennsalt Chemicals

Metal Cleaners • Phosphate Coatings • Cold-Working Lubricants

A BETTER START FOR YOUR FINISH

Fantastic Five Hundred

(*Continued from page 57*)

right at angles up to 36 deg; with diagonal or transverse torsion bar suspension on rigid axles; and, this year, a pronounced trend toward the return of narrow tread.

Some typical dimensions would be: wheelbase about 96 in.; front tread 52 or 53 in., rear 49 or 50; body width 28 to 36 in., body height at head rest 30 to 32 in.; dry weight 1650 to 1800 lb depending on design.

New roadsters for this year's race came from Ed Kuzma, Luje Lesovsky, and Frank Kurtis. The latter's new design (see cut of Bowes Seal Fast No. 15 started by Johnny Boyd) features even lower lines overall, narrower body, and sharper tail tip than the earlier models in his 500 series.

The Kuzma roadsters for this year have pleasingly rounded body cross sections where earlier designs, including Kurtis', are more slabsided and have a rather bulbous horizontal axis of tail tip.

Also a new roadster this year, the winning car built by A. J. Watson, chief mechanic for the John Zink interests, is a very good example of design beamed toward light weight (which means simplest possible construction) and small size. This car has a decidedly narrow tread in rear while being fairly narrow in front. Weight has been very carefully saved by elimination of all redundant members and paring of some structures to absolute minimums. See article in AI issue of May 15, page 54.

By way of conclusion, it is appropriate to state here that the higher speeds attained at Indianapolis this year probably are due to improvement in the track. It was resurfaced completely last year (except, of course, for the brick home straight) and is now smooth as a boulevard.

From this observer's standpoint, nothing in the cars themselves would explain the higher speeds. True, there has been some slight evolution during the past year but few, if any, actual innovations. A few refinements of some note are to be found in the new roadsters mentioned above but in general we're still dealing with a breed of cars distinguished by any significant variety.

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Continental Aviation and Engineering Corporation has numerous openings for personnel interested in challenging careers in gas turbine and reciprocating engine development. For information, address Engineering Personnel Department, 12700 Kercheval Ave., Detroit 15, Mich.

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Zagar 4-POST RAM TYPE DRILLING MACHINES

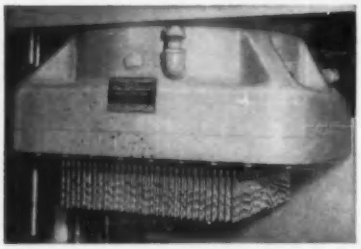
RELEASE HIGH COST DRILL PRESSES FOR OTHER IMPORTANT JOBS

● Zagar hydraulic drilling machines are designed for high speed drilling—for both production and limited runs. Zagar 4-post machines reduce high cost tooling, and handle a range of work that ordinarily necessitates the use of *several different machines*. Very important, Zagar drilling machines release capital equipment for other purposes. Zagar 4-post machines lower your capital investment. They quickly pay out. What, sir, are your production requirements?

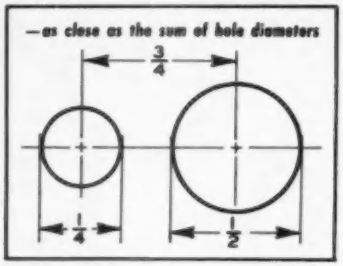
Zagar hydraulic ram-type 4-post machine drills 150 holes, 1/4" through 5/8" dia., in aluminum casting at one pass.

Zagar GEARLESS DRILL HEADS

are the answer to close-center drilling on your own equipment



1000 spindles, drilling simultaneously, are possible with Zagar gearless drill heads. Any pattern drilling any machinable material is standard practice; any size up to 1½" dia. . . . Zagar can design the tooling for the entire drilling job; or, a Zagar



gearless drill head can be used on your existing drill press. Zagar engineering is flexible enough to recommend and supply the answer that will cost the least and produce the most.

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ZAGAR, INC.

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Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

AIRBRIEFS

(Continued from page 96)

He urged the operators to take the leadership in assisting city planners to prepare for the future and determine realistic policies for helicopter operation. City and regional planning groups should be shown that, although the helicopter poses its own problems, it can hurdle ground transportation barriers in moving people, mail, freight, and express faster and more efficiently to relieve already over-taxed surface transportation systems.

Air Travel Seen Top Bargain

Commercial air travel, which soared to new highs during 1955, dropped in one important aspect—ticket costs to passengers. The level of average air fare in 1955 remained just about where it stood in 1938, but in terms of 1938 dollars the average air fare was slashed by 60 per cent.

The traveling public's ability to spot a bargain is indicated by the phenomenal gain of almost 10,000 per cent in revenue passenger miles since 1933. During 1955, the nation's scheduled domestic airlines passed the billion dollar mark in total operating revenues, and the airline industry offered four times as many available ton miles last year as in 1946.

U. S. Capital of Air Activity

America's leadership in civil aviation is dramatically demonstrated in a recent survey by the Aircraft Owners and Pilots Association. One U. S. airport, Chicago's Midway, annually handles more total traffic than the airports of Amsterdam, Copenhagen, London, Paris, and Zurich combined. Midway is the world's busiest airport.

Comparisons of air traffic between major cities of Europe in 1955, and U. S. cities handling comparable traffic in 1954, are even more significant. For instance, Amsterdam's total air traffic count in 1955 was 51,876 persons; Grand Rapids, Mich., in 1954 registered 51,989. Brussels recorded a traffic rate of 41,520; Binghamton, N. Y., had 41,481. Copenhagen had 52,620; Yakima, Washington, had 52,891. London had 98,808; Tampa, Florida, had 99,363. Paris had 86,742; Ontario, Calif., had 86,544.

U. S. air traffic figures for 1955 are not yet available, but year-end estimates indicate a 20 per cent increase over 1954. Not a single major European airport had a traffic rate comparable to one of the 10 busiest U. S. airports.

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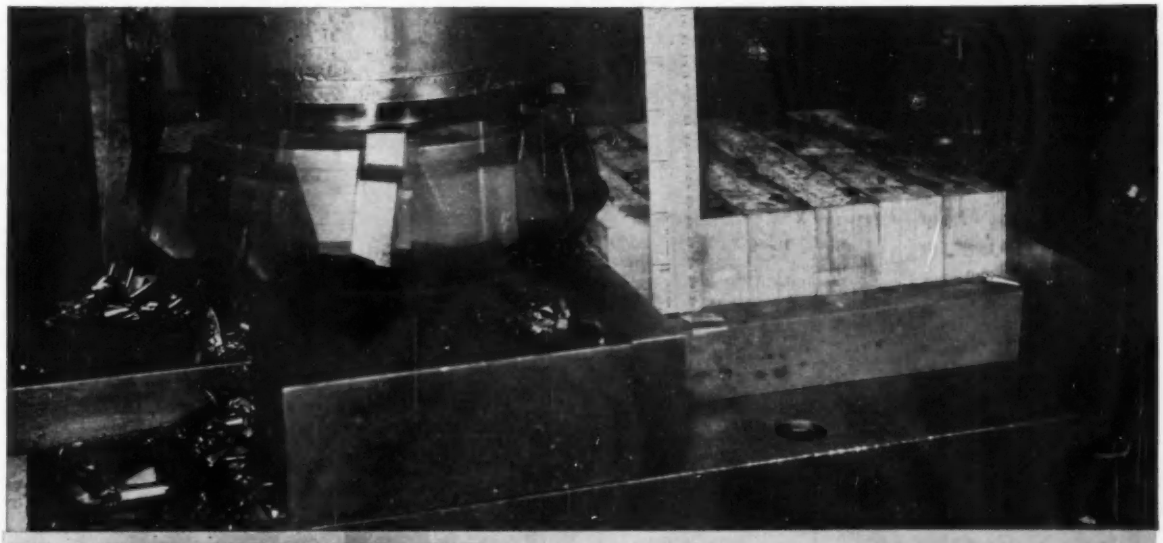
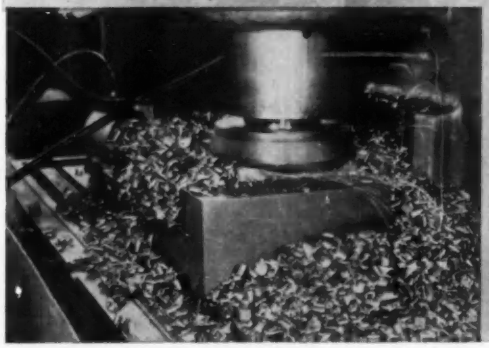
❶ INCREASE PRODUCTION ❷ GIVE UP TO 50% LONGER LIFE





DETAILS OF JOB ILLUSTRATED

Machine	Sundstrand Rigid Mill
Cutter Size	10" Diameter
No. of Teeth	12
Carbide Inserts (grade)	Carmet CA-610
Rate of Travel	400 S.F.P.M.
Table Speed	10 in. per minute
Depth of Cut	½ inch
Material	1095 Cold Drawn Shank Steel, 200 Brinell

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Complete Technical and Shop Data on the Carmet "CA-600 Series" of special steel-cutting Carbides

Write for Your Copy

ADDRESS DEPT. AI-78

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These heavy-duty CA-600 Carmet grades (premium products in performance, *at no premium in price*) have been thoroughly job-proved in the field. They're available to fit *your* steel-cutting requirements . . . *let us arrange a demonstration of their ability to save time and money for you.* Get in touch with your nearest A-L representative or distributor, or address ***Allegheny Ludlum Steel Corporation, Carmet Division, Detroit 20, Michigan.***

For ALL your CARBIDE needs, call

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AL — FINE TOOL STEELS SINCE 1854

BUSINESS PULSE

(*Continued from page* 98)

tute by far the largest single share of GNP, showed only a fractional percentage gain from the final quarter of 1955 to the first quarter of 1956, whereas earlier the uptrend in this sector had been pronounced. Expenditures for services did continue their previous expansion, but spending on the physical goods was sluggish. Outlay on automobiles and parts declined, while spending on all other goods showed only a modest increase. In brief, there wasn't much dynamism in consumption expenditures in the first quarter of the year.

Gross private domestic investment also failed to impart much impetus to general business activity in the first quarter, as a further decline in spending for residential construction and an easing off in the rate of inventory accumulation more than offset vigorous expansion in outlay on producers' durable equipment. There is some evidence that the downtrend in residential building was arrested during the first quarter, which means that the over-all construction component of GNP could possibly show a moderate gain in the second and subsequent quarters in view of indications that non-residential activity has continued to rise. However, there is a growing belief that inventory accumulation is likely to moderate still further, if indeed it has not already done so. Thus, even if outlay on producers' durable equipments keeps on rising, as seems likely, there is no guarantee that the aggregate investment component of GNP will move similarly.

Government Buying

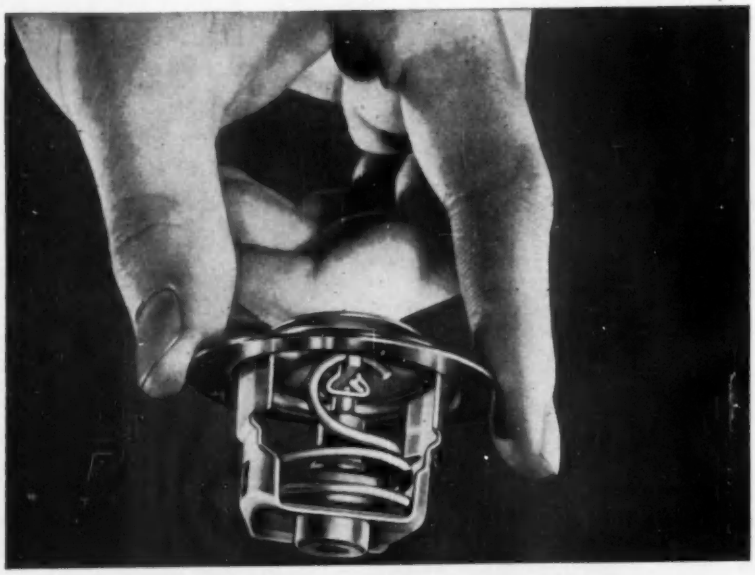
Governmental purchases of goods and services were stable at high levels in the first quarter of the year, as a moderate gain in spending by State and local governments more than offset a slight decline in outlay in the Federal Government. The essential characteristic of this sector is clearly this lack of strong directional movements. This means that governmental outlay can probably be taken for granted as a stabilizing prop for the immediate future, but there would seem little justification for regarding it as a significant factor of expansion.

With governmental outlay and construction apparently in close balance, the strategic variables for the future become inventory changes, producers' durable equipment and consumption expenditures.

The fact that a good deal of recent inventory accumulation appears to have been motivated by prospective price advances and concern about possible interruptions of supply suggests strongly, as has been indicated, that inventory buying is likely to become a factor of diminishing importance. And while producers' durable outlay seems to be following a pattern of expansion, it is an open question as to whether it will prove a full offset. This seems to leave retail trade as the probable determiner of the near-term business trend.

Retail Trade

If such a conclusion is justified, information on developments since the first quarter can hardly be said to be of auspicious character. There has certainly been no significant evidence that the sluggishness in retail markets is passing. Indeed, the Commerce Department's preliminary estimates of retail trade for April indicate a decline from the March level on a seasonally adjusted basis. Moreover, the optimism of the buying public can hardly have been bolstered by the



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THOR'S new 7½ pound vertical air grinder is more powerful, more versatile. It can save time and money in your operation. Check these features to see how:

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Can accommodate sanding discs up to 9" diameter, depressed center wheels up to 7" diameter, cup wheels and wire brushes up to 6" diameter.

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Extremely quiet exhaust.

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6" wire brush with stationary guard

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9" sanding disc

Depressed center wheel

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Smooth, positive stops

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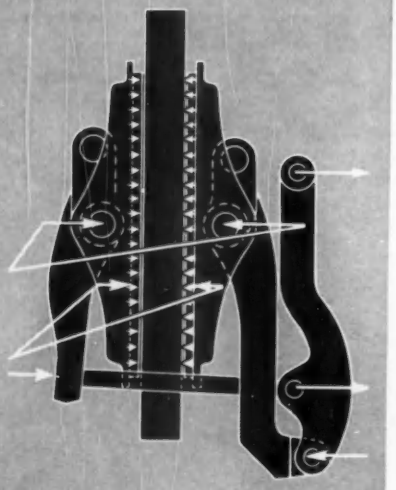
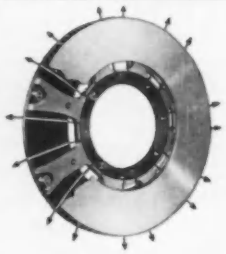
Lower service costs



TRU-STOPS are real emergency brakes—not just parking brakes. They serve as auxiliary brakes on long down-grades and can bring the vehicle to a smooth, quick stop if service brakes should fail suddenly. TRU-STOPS can do this and more. They can handle the vehicle with safety so that it can be removed from the road.



Air-Cooled

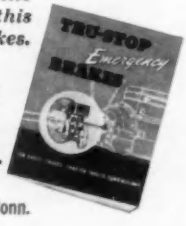
• The terrific heat generated in braking shortens lining life. TRU-STOP design quickly dissipates this heat. Most of the disc is exposed to the air even during braking. And a jet of cooling air circulates between the disc blades and carries off heat.

Smooth, positive stops are assured as the pressure is in direct proportion to the pull on the brake lever. There is no dangerous self-energizing or "over-braking."

TRU-STOPS hold on grades for safe parking. They prevent parking brake accidents.

Lower service costs come from the fact that TRU-STOPS are mounted directly on the drive shaft. Their simplicity of design and accessibility reduce maintenance requirements. Relining or adjustment is a simple job for any mechanic with ordinary tools. It is not necessary to drop the drive shaft.

Specify TRU-STOPS for factory installation on the next vehicle you buy. Send for your copy of this booklet—the complete story of TRU-STOP Brakes.



ACCO

TRADE MARK

Automotive and Aircraft Division
AMERICAN CHAIN & CABLE

601 Stephenson Bldg., Detroit 2
2216 South Garfield Ave., Los Angeles 22 • Bridgeport 2, Conn.

considerable emphasis which has been given to the deepening of the automobile recession.

Any further weakening of consumer buying could have negative repercussions on the capital-spending plans of business, which currently loom so large. It is sometimes argued that such spending is geared to long-term considerations and hence is not greatly affected by fluctuations in consumption expenditures over short periods. However, in order to satisfy oneself that this is not necessarily true, one has only to consider the spectacular upgrading of capital spending plans occasioned by the 1955 boom, which drew so much of its substance from consumer willingness to buy. If the connection between this upgrading and the boom is acknowledged, then it would seem necessary to admit the possibility that a cessation of boom conditions—such as we now seem to be experiencing—could lead to a downgrading of investment plans.

By the third quarter the situation should be greatly clarified.

BOOKS . . .

AUTOMOTIVE MECHANICS, *by William H. Crouse, published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, $6.75.* The third edition of this practical, well-illustrated book includes descriptions of such comparatively recent developments as automatic transmissions, 12-volt electrical equipment, four-barrel carburetors, power steering, power brakes, V-8 engines, tubeless tires, air conditioning, etc. The author discusses every phase of the automobile from engine contruction, engine service, lubrication, clutches, and overdrives to brakes, brake service, and tires and tire service. The major emphasis is on practical operation, servicing, and repairing procedures. Trouble-shooting charts and trouble-analysis chapters aid in tracking down the cause of any kind of trouble. The book is written in simple, nontechnical language for the layman; because of its wealth of essential information, it will be helpful to anyone who wants to know how to keep a car in first-rate condition.

THEORY AND PRACTICE OF LUBRICATION FOR ENGINEERS, *by Dudley D. Fuller, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $10.50.* This book attempts to present a balanced treatment of theory and practice in lubrication. After a discussion of basic principles, the author ranges widely in the field of applied lubrication. Numerous examples are worked out in discussions of problems. Many bearing designs are given, including those for tools, turbines, generators, large motors, rolling mills, ball mills, and centrifuges. Outstanding examples of recent research in lubrication are covered. The author has also deliberately included a great deal of material on hydrostatic lubrication, because, as he explains, of the numerous, still-unexplored, possible applications, ranging all the way from air bearings to heavy rolling-mill bearings.

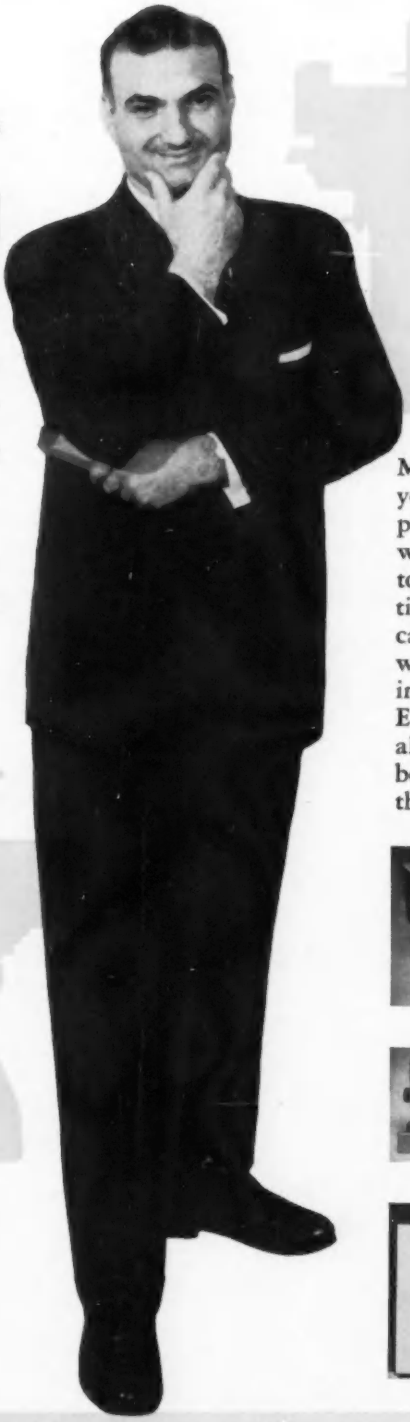
my name is

Ping Ianitelli

in charge of our

"Prove It"

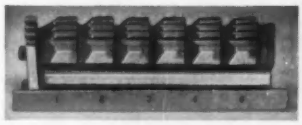
division at elox



My division will actually machine parts for you. Not just a single sample, but enough production runs to provide a true evaluation of what Elox Electrical Discharge Machine tools can do in your plant. Tungsten Carbide tipped single point tools, forging dies, die casting dies and Tungsten Carbide form tools will be machined at a cost we guarantee impossible to duplicate except with Elox E.D.M. I've been able to prove to hundreds of alert concerns that these jobs can be done better, faster and less expensively with Elox than by any other method.

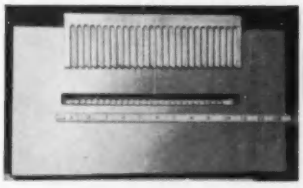
WE SAVED 19 MINUTES

grinding this single point tungsten carbide tip boring tool.



WE SAVED 16 HOURS

plus 9 different operations on this form grinding of a carbide broach.



WE SAVED 379 HOURS

on the machining of this die casting die.

WHATEVER IT'S COSTING YOU NOW... CHECK WITH ELOX

elox *corporation of michigan*

*T.M. Reg.

1827 STEVENSON HWY. • ROYAL OAK 3, MICH.

AIRengineering at work

REPORT No. 5098B-3

Multiple Screw Driver assembles 400 carburetors per hour

Assembling carburetors was a slow, one-screw-at-a-time operation until AIR engineering solved the bottleneck. Now one operator uses this 8-spindle automatic Multiple Screw Driver to help turn out more than 6 completed carburetors per minute—400 every hour.

This compact, easy-to-operate Multiple Screw Driver is just one more example of how AIR engineering is helping modern industry solve problems and cut production time and costs.

All the experience of Ingersoll-Rand in speeding up fastening through AIR engineering multiple units is yours for the asking. Whether your operations involve screw-driving or nut running with either hand-held or automatic production line units, Ingersoll-Rand can engineer and build just the unit best suited to your needs.

8-Spindle Multiple Screw Driver for carburetor assembly.

Drop us a line if you'd like an AIR engineer to analyze and make recommendations on your fastening operations.

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

8-341

New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to Apr. 18, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which was published in the May 15 issue, page 120, of AUTOMOTIVE INDUSTRIES, the following additional certificates were announced by the Office of Defense Mobilization, covering the period which extends from Apr. 19 to May 16, inclusive.

The figure appearing in parentheses is the percentage authorized in respect to actual fast tax write-offs.

AVICA CORP., Middletown, Rhode Island
Military aircraft parts—$4000 (70)

BENDIX AVIATION CORP., Bendix Products Div., South Bend, Ind.
Military aircraft components—$1,121,930 (40)
Military aircraft engine parts—$29,700 (40)

CURTISS-WRIGHT CORP., Wright Aeronautical Div., Wood-Ridge, N. J.
Military aircraft engines—$212,000 (60)

DOUGLAS AIRCRAFT COMPANY, INC., El Segundo, Calif.
Military aircraft—$2,333,556 (130)

EMPIRE TOOL PRODUCTS, INC., Garden City, L. I., New York
Military aircraft components—$18,430 (70)

EX-CELL-O CORP., Elwood, Indiana
Aircraft engine parts—$350,739 (45)

FAIRCHILD ENGINE AND AIRPLANE CORP., Hagerstown, Maryland
Military aircraft and components—$108,291 (65)

GENERAL DYNAMICS CORP., San Diego, Calif.
Military aircraft engines—$34,000 (60)

GENERAL MOTORS CORP., Indianapolis, Ind.
Research and development—$13,955,151

GOODYEAR AIRCRAFT CORP., Akron, Ohio
Aircraft components—149,002 (60)

LOCKHEED AIRCRAFT CORP., Burbank, Calif.
Military aircraft—$2,011,431 (125)

LOCKHEED AIRCRAFT CORP., Missile Systems Div., Palo Alto, Calif.
Research and development—$2,423,000 (60)

LOCKHEED AIRCRAFT CORP., Marietta, Georgia
Military aircraft and parts—$1,953,057 (65)

LORD MANUFACTURING COMPANY, Erie, Pa.
Military aircraft engines and parts—$61,000 (65)

MARQUARDT AIRCRAFT CO., Van Nuys, Calif.
Research and development—$852,384 (60)

GLENN L. MARTIN CO., Jefferson County, Colorado
Military aircraft—7,500,000 (60)

GLENN L. MARTIN COMPANY, Baltimore, Maryland
Military aircraft—$147,804 (65)

NORTHROP AIRCRAFT, INC., Hawthorne, Calif.
Military aircraft—$970,951 (190)

PROTAIR CORPORATION, Los Angeles, Calif.
Military aircraft parts—$39,350 (70)

UNITED AIRCRAFT CORP., East Hartford, Conn.
Military aircraft engines — $4,448,000 (60)
Research and development—$1,330,000 (60)

UNITED AIRCRAFT CORP., Hamilton Standard Div., Windsor Locks, Conn.
Military aircraft parts—$727,714 (130)

VICKERS, INC., Jackson, Mississippi
Military aircraft components—$1,309,000 (40)

WESTLAND OIL COMPANY, INC., Williston, North Dakota
Oil refining facilities—$402,040 (65)

WESTON HYDRAULICS, LTD., North Hollywood, Calif.
Military aircraft parts—$58,760 (70)

BOOKS . . .

ASTM STANDARDS ON PLASTICS, *published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, $5.75.* ASTM standards and tentative specifications, methods of analysis, methods of physical testing, recommended practices and definitions of terms are presented in convenient form in this compilation. It has been substantially revised since the previous edition was published in 1954. Of the total of 143 specifications and tests, 4 are entirely new and 41 have been either revised, reaffirmed or advanced from tentative status to standard. The standards were developed by ASTM Committee D-20 on Plastics and will be of value to plastics engineers and to anyone concerned with the design and production of plastics and items in which plastics are used.

ELECTRONICS, *by A. W. Keen, published by Philosophical Library, 15 E 40th St., New York 16, N. Y. Price, $7.50.* The author describes this book as an introduction for the layman and student to the science of electrons in action. Written in clear non-technical language, the volume gives a comprehensive explanation of electronic devices and their applications. Although the treatment is elementary, the book ranges over the entire field of electronics, covering such aspects of the subject as control devices, tubes, signals, circuit elements, radio, radar, television, computers, instruments, etc. Altogether an excellent contribution to a field which has not been notable for the intelligibility of its literature.

ELEVATED-TEMPERATURE PROPERTIES OF CARBON STEELS, *published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, $3.75.* This compilation, the fourth in a current series on the elevated temperature properties of various metals, includes data for tensile and yield strength, elongation and reduction of area, stresses for creep rates of 0.0001 and 0.00001 per cent per hour, and rupture strengths for 100, 1000, 10,000 and 100,000 hours. The primary sources of data were the laboratories engaged in the evaluation of metals for elevated temperature service; but data has also been included from trade bulletins and the published technical literature. The properties are given in graphical form and are supplemented by copies or original data sheets from the various contributors.

Have you seen what this CAN DO FOR YOU?

SIZE 5040T* TORSION BAR

Torque control IMPACTOOL

NEW accuracy and speed for precision nut running jobs . . .

- **POSITIVE TORQUE CONTROL**—a revolutionary use of a rugged steel torsion bar for precision control of torque—combined with the power and speed of the Impactool.
- **SIMPLE TORQUE SETTING**—torsion bar adjusting sleeve is clearly calibrated for changing torque with easy-to-use torque jig.
- **TORQUE SETTING REMAINS CONSTANT**—for any nut running condition until the adjustment is changed.
- **ELIMINATES "OVER-TORQUE"**—impact mechanism rebounds instantly when preset torque is reached, tripping a foolproof rubber faced shutoff valve.
- **LOW MAINTENANCE**—combines many of the proven features of Ingersoll-Rand Impactools, with their enviable record of dependable performance and low maintenance.
- **REVERSIBLE**—full power in either direction.
- **NO CLUTCH**—to wear, slip or require adjustments.

* 2 TORSION BARS PROVIDE MULTIPLE TORQUE SETTINGS

- No. L735 Max. torque 60 ft. lbs.
- No. H735 Max. torque 90 ft. lbs.

For torques up to 550 ft. lbs. a Size 5340T Torque Control Impactool is available.

Get a free demonstration of Ingersoll-Rand Torque Control Impactools by an I-R AIR engineer now... or write for additional information.

Ingersoll-Rand
11 Broadway, New York 4, N.Y.
8-342 IMPACTOOL DIVISION

More Government Contract Awards

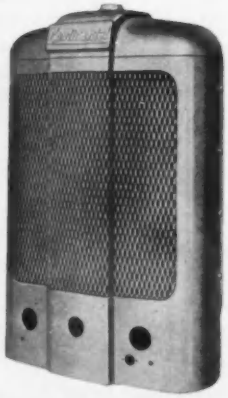
THIS latest list of Government prime contracts that have been awarded covers the period from Apr. 26 to May 24, 1956. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, airplanes, automotive components and spare parts, automotive maintenance equipment, etc.

AEROQUIP CORPORATION, Jackson, Michigan
Coupling, half assy.—24 items—$122,385

AIRCOOLED MOTORS, INC., Syracuse, New York
Engines—$336,752

YA® Radiators

TERMINAL ISLAND in Los Angeles Harbor has been sinking at an alarming rate, and it is estimated that by 1965 the entire island will have slipped beneath the surface. To delay this sinking, and to protect huge industrial plant investments on the island, giant pumps have been installed within the dikes surrounding the plant to take care of the seepage. And these engine driven pumps, on which so much depends, are equipped with Yates-American Heavy Duty Radiators. If you are confronted with a similar problem, call on Yates-American to come up with the correct answer in dependable radiator equipment.



California Representative: E. E. Richter & Son, Emeryville, California

YA® HEAT TRANSFER PRODUCTS DIVISION
Yates-American
BELOIT, WISCONSIN
BRANCH OFFICES
Chicago, Illinois, High Point, North Carolina, Memphis, Tennessee, Portland, Oregon

AMERICAN AIR FILTER CO., INC., Herman Nelson Div., Moline, Ill.
Engines—250 ea.—$63,885

AMERICAN BOSCH ARMA CORP., American Bosch Div. Springfield, Mass.
Maintenance parts used on magneto assy.—various—$303,945

AMERICAN BOSCH ARMA CORP., Garden City, New York
Facilities for production of fire control systems—$190,000

AMERICAN LA FRANCE CORP., Elmira, New York
Spare parts—2101 ea.—$51,373

THE ARMSTRONG RUBBER COMPANY, West Haven, Conn.
Tire, 14.00 x 20—812 ea.—$88,061

THE B. G. CORPORATION, Ridgefield, New Jersey
Spark plugs—49,400 ea.—$64,961

BEECH AIRCRAFT CORP., Wichita, Kansas
Multi-purpose servicing units-ground towings, air start, electric and air servicing for RB66 aircraft support—$4,303,041
Maintenance of 23 ea. L-23 type aircraft—$150,970
Power supply unit, aircraft starting—20 ea.—$203,502

BENDIX AVIATION CORP., Bendix Products Div., South Bend, Ind.
Wheel assys.—various—$234,104
Parts used on fuel controls—various—$222,840
Maintenance parts—various—$370,794

BENDIX AVIATION CORP., Pioneer-Central Div., Davenport, Iowa
Transmitter, rate of fuel—3285 ea.—$831,072

BURNER-HOLLOMAN MANUFACTURING Corp., Hyattsville, Maryland
Universal jet engine overhaul stand—200—$268,800

CATERPILLAR TRACTOR CO., Peoria, Illinois
Tractor, track-laying—19 ea.—$244,017
Tractor, full-tracked—55 ea.—$795,545

CHAMPION SPARK PLUG COMPANY, Toledo, Ohio
Spark plug—934,765 ea.—$1,144,414

CHICAGO RAWHIDE MANUFACTURING CO., Detroit, Michigan
Tank spare parts—8245 ea.—$154,099

CHRYSLER CORPORATION, Detroit, Michigan
Automotive spare parts—1740 ea.—$106,185
Study of test techniques for J-65 engine fuel controls—$53,872

CLARK EQUIPMENT CO., Industrial Truck Div., Buchanan, Mich.
Production of two forklift trucks, 6000 and 10,000 lb.—job—$89,859

THE CLEVELAND PNEUMATIC TOOL CO., Cleveland, Ohio
Maintenance parts used for aircraft—various—$53,630

CONTINENTAL AVIATION AND ENGINEERING CORP., Detroit, Mich.
Repair and overhaul of YJ-69-T-19 turbojet engines—10 ea.—$90,850
Repair and overhaul of eight turbojet engines—$43,184

CONTINENTAL MOTORS CORP., Detroit, Mich.
To produce engines and parts—$135,739

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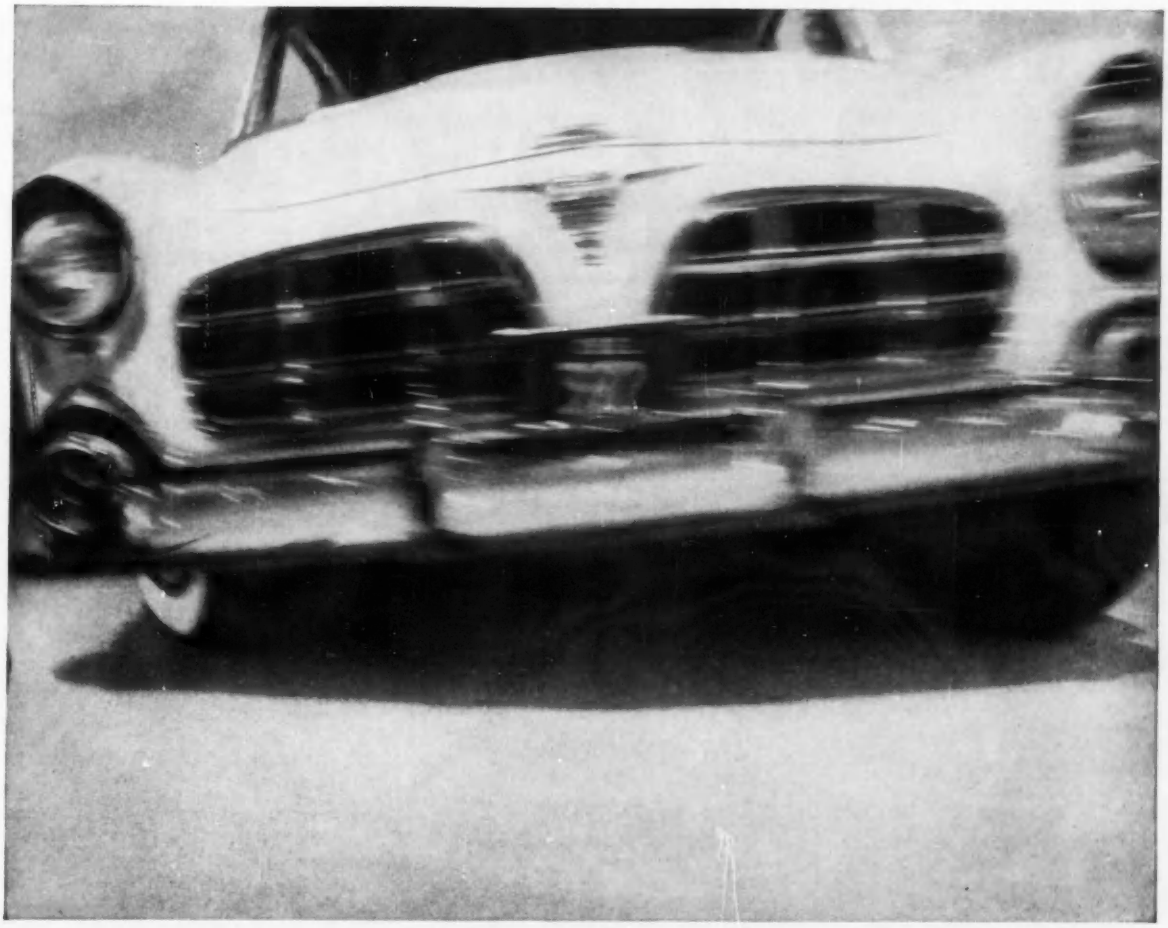


Typical tire distortion caused by high-speed turn. Tougher, stronger nylon cord tires resist damage from such everyday punishment.

THERE'S EXTRA SAFETY IN NYLON CORD TIRES

Du Pont produces the nylon fiber.
Tire manufacturers make nylon cord tires
—in tubeless or conventional types.

Tires are among the components that can help make today's fine cars even safer. For our roads—whether superhighway or city street—are traveled to a point that tire failure of *any* kind is a potential danger.

- Nylon cord tires offer utmost safety, surest protection against tire trouble. Nylon tires have proved their superiority on military and commercial planes and on heavy-duty trucks. The people whose lives and livelihood depend on the ability of cars to perform at high speeds rely on nylon tires. Turnpike police, professional auto racers and high-speed test drivers are examples.
- Nylon cord tires reduce unsprung weight, and they readily absorb the added strains of power steering, braking, and higher horsepower.
- Nylon cord tires are among the components which contribute importantly to motor-car safety. They are the coming standard of the industry. As original equipment, they provide a valuable sales feature—extra safety.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

DU PONT

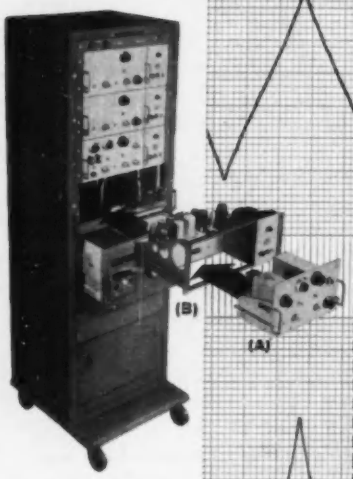
REG. U. S. PAT. OFF.

SANBORN *Recording Permapaper*

ALL SANBORN 150 SERIES OSCILLOGRAPHIC RECORDERS PROVIDE THESE

SPECIFIC ADVANTAGES

The three foremost operating advantages of a Sanborn "150" are evident in the record, and are given at the right. Equally popular with industrial users is the *wide versatility* of these systems. Each one comprises a basic assembly to which the user adds his choice of an interchangeable, plug-in type preamplifier for each channel. Presently available different preamplifiers now number *eleven*.



Preamplifier (A) shown in position to plug into a Driver Amplifier with Power Supply (B) which are normally already in place in the Basic Cabinet Assembly

Rectangular Coordinate Recording

is a Sanborn feature that is especially valuable in multi-channel recording. The user of a 2-, 4-, 6- or 8-channel "150" system can record interrelated events simultaneously on one strip of record paper, and then correlate them against time quickly and accurately, even during the recording.

Clear, Sharp, Inkless Tracings

The nichrome ribbon tip "150" heated stylus removes the white opaque surface of Sanborn recording paper (Permapaper) permitting the black undercoating to show. Tracings are permanent, will not fade or smudge.

Improved Over-all Linearity

resulting from current feedback design of Driver Amplifiers and new shorted coil frame, high torque (200,000 dyne cm.) galvanometers. Maximum error over middle 4 cm. of chart: 0.25 mm . . . over entire 5 cm. chart width: 0.5 mm.

INDUSTRIAL DIVISION

SANBORN CO.

195 Massachusetts Ave., Cambridge Mass.

A new "150" Catalog provides complete descriptive data, specifications and prices on all 150 Systems, Accessories and Cabinets. A copy will be sent on request.

(*Continued from page* 126)

CONTINENTAL MOTORS CORP., Aircraft Engine Div., Muskegon, Mich.
Spare parts—10,390—$196,524

COOPER TIRE & RUBBER CO., Findlay, Ohio
Tire, 7.50 x 20—24,000 ea.—$627,360

CUMMINS DIESEL EXPORT CORP., Columbus, Indiana
Generators—7 ea.—$48,852

CURTISS-WRIGHT CORP., Caldwell, New Jersey
Repair and/or modification, propeller blades—$500,000

CURTISS-WRIGHT CORP., Wright Aeronautical Div., Wood-Ridge, N. J.
Engine spare parts—$92,294

DIAMOND T MOTOR TRUCKS SALES, Washington, D. C.
Tractors—2 ea.—$14,706

DOAK AIRCRAFT COMPANY, INC., Torrance, California
Design, construction, and testing of Vtol aircraft—$341,633

ELECTRIC AUTO-LITE COMPANY, Toledo, Ohio
Starter, engine assembly for truck—$26,019
Spark plug, shielded, 14-mm—$53,967
Spark plugs—274,025 ea.—$327,460

THE ELECTRIC STORAGE BATTERY CO., Exide Industrial Div., Philadelphia, Pa.
Batteries—16,450 ea.—$737,947

THE FIRESTONE TIRE & RUBBER CO., Akron, Ohio
Replacement spare parts for vehicle M59 (T59)—$42,212
Tire, 7.50 x 20—74,500 ea.—$1,885,525

FOOD MACHINERY & CHEMICAL CORP., San Jose, Calif.
Carrier, full-tracked, armored M59—various—$3,000,000

FORD MOTOR COMPANY, Ford Div., Washington, D. C.
Trucks—47 ea.—$118,794
Automobiles—27 ea.—$36,606
Sedans, station wagons and trucks—22 ea.—$31,324

FORD MOTOR CO., Ford Div., Livonia, Michigan
Automobile, station wagon—289 ea.—$417,552

FORD MOTOR CO., New York, N. Y.
Trucks—5 ea.—$12,796

THE GARRETT CORP., AiResearch Mfg. Co. of Arizona, Phoenix, Ariz.
Modification of gas turbine power units—$239,856

GENERAL MOTORS CORP., AC Spark Plug Div., Flint, Michigan
Bombing navigational computer components—$6,161,805

GENERAL MOTORS CORP., AC Spark Plug Div., Milwaukee, Wis.
Regulators—270 ea.—$106,650
Modification kits for bombing navigational computer—$54,758
Replacement kits for computer—$31,518
Modification kit for ME-5 BNC—$177,988
Modification kits for radar—$37,442
Modification kits for A-1A BNC—$247,540
Modification kits for FCS—$135,497

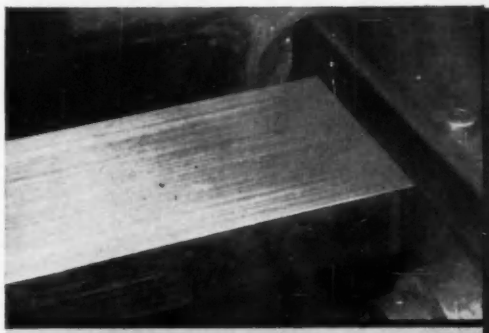
GENERAL MOTORS CORP., Aeroproducts Div., Dayton, Ohio
Modification kits for propellers—$76,195

(*Turn to page* 144, *please*)

NEW, BETTER

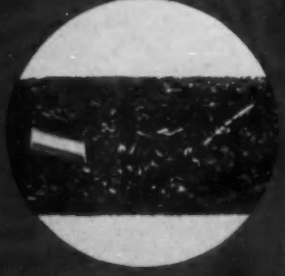
C/R way wiper

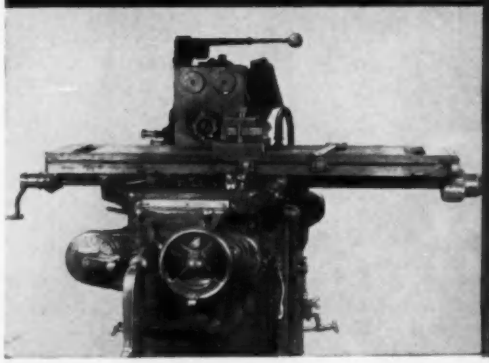
guards the life, cuts downtime, saves costly maintenance on machine tool ways



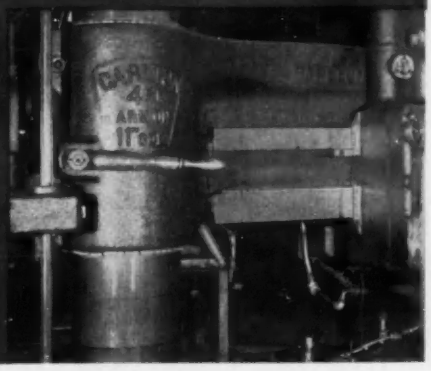
This close-up photograph shows harmful chips and abrasives trapped in a fibrous wiper that permitted scoring of the lathe way shown at left.

The extent of scoring and abrasion caused by chips trapped under the carriage is clearly shown in this photograph of a lathe way.





C/R Way Wipers are quickly, easily installed on this milling machine, as well as on shapers, grinders, planers, and gear cutters.



The clean, score-free wiping action of C/R Way Wipers is evident again in this partial view of a radial drill. Note how close, accurate lip contact on the column is achieved, even though the wiper is mounted on uneven surfaces.

How many hundreds of dollars are scoring and abrasion of machine tool ways costing your shop each year . . . dollars that could easily be saved? C/R Sirvene (synthetic rubber) Way Wipers make it unnecessary to tolerate this expensive damage. They are designed and precision molded for an extremely accurate fit. They will *not* trap harmful materials . . . will not mark or smudge ways. They will wipe ways clean of dirt, chips, fine abrasives . . . even water emulsions . . . yet leave a thin, protective oil film. C/R Sirvene Way Wipers will fit flat ways, side rails, angles, columns and hydraulic rams . . . and are easily installed. They will save you many times their cost. Please write for illustrated brochure that gives complete details.

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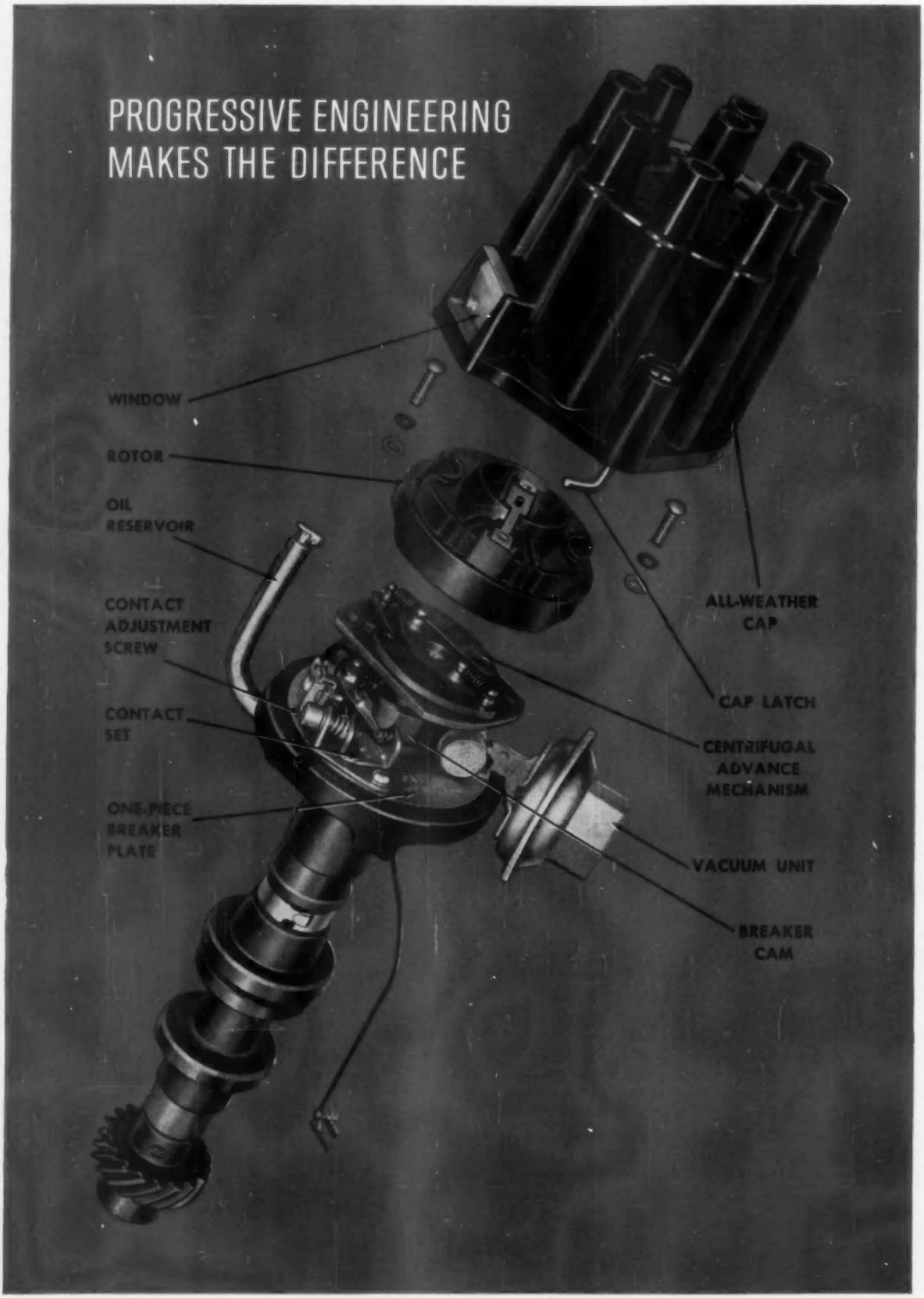

A New Concept of Diesel Combustion

1. the hydrocarbon molecules are

DELCO-REMY DEVELOPS REVOLUTIONARY NEW EXTERNAL ADJUSTMENT DISTRIBUTOR

Designed especially for *present* and *future* high-compression engines, Delco-Remy's trend-setting new external adjustment distributor increases timing accuracy, provides greater electrical efficiency and durability combined with unprecedented ease of servicing.

Contact point opening (and hence cam angle) is adjustable through a "window" in the cap *while the engine is running*. No special tool is required—just a simple "hex" wrench. The contact point set is a unit completely assembled and adjusted before being attached to the breaker plate . . . is easy to replace, in servicing, with a new factory-adjusted set, simply by removing two attaching screws.

Centrifugal advance components have been relocated to a position *above* the circuit breaker mechanism, making it possible to locate the high-rate-of-break cam and the high speed breaker lever directly adjacent to the main bearing, for maximum rotational stability. The new one-piece circuit breaker plate rotates about the upper main bearing on a precision-fit bearing surface concentric with the shaft. Because of this new low-friction, concentric-rotating breaker plate, vacuum advance performance and hence fuel economy, are improved.

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This all-new design in ignition distributors is another example of Delco-Remy leadership "Wherever Wheels Turn or Propellers Spin."

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GM GENERAL MOTORS

GENERAL MOTORS LEADS THE WAY—STARTING WITH

Delco-Remy

ELECTRICAL SYSTEMS

The most important fuel property

Making the spray finer may help

to ignite by compression ignition. We

A New Concept of Diesel Combustion

(*Continued from page 67*)

carbon nuclei which grow into particles of soot, varying in diameter from 0.1 to 1.0 micron (6). Part of that carbon will burn during combustion, but part of it will fail to oxidize and will be released from the luminous flame as soot, which is either pure carbon or predominantly carbon. Soot either leaves the engine in the form of exhaust smoke, or becomes deposited on the combustion chamber surfaces as lacquer, coke, and other residues.

We may conclude that oxygen deficiency is not the primary cause of smoke. Even with a considerable excess of oxygen during combustion smoke may appear if:

1. the hydrocarbon molecules are exposed to cracking temperature (750-1000 F) for a sufficient length of time, and
2. one of the ultimate cracking products is carbon, and
3. that carbon fails to oxidize completely before it leaves the flame region.

On the other hand, we may have a deficiency of oxygen. In other words, burn an overrich mixture and still have no smoke if:

1. the hydrocarbon is of such composition (as methyl alcohol) that the products of thermal decomposition do not include carbon, or
2. no solid carbon forms as the excess carbon oxidizes into CO, or
3. the carbonaceous end-products of the thermal decomposition completely burn inside of the flame.

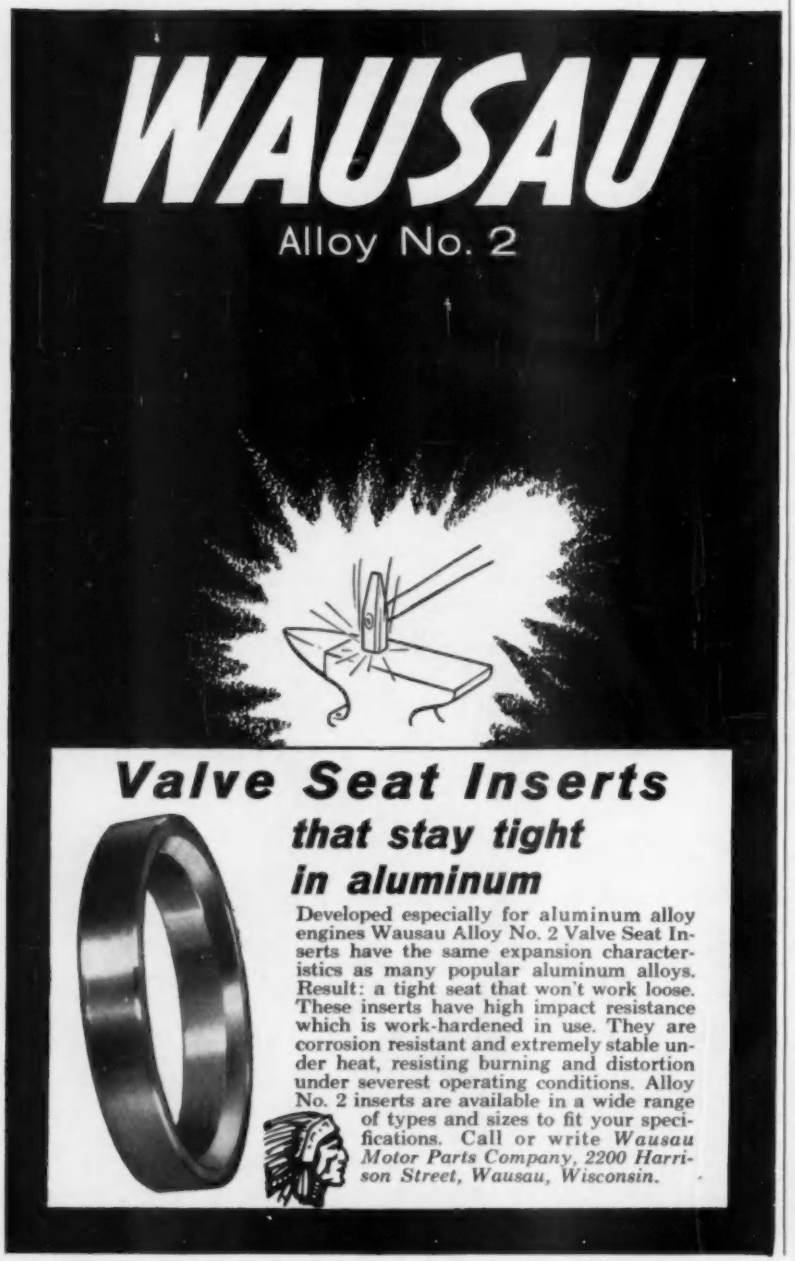
While shortage of oxygen is not the primary cause of smoke, such shortage promotes smoke formation so powerfully that smoke is generally associated with oxygen deficiency (7). Oxygen deficiency may be overall as in a premixed flame or in a gas engine, or only local as in a diffusion flame or a Diesel engine. If the amount of oxygen present is insufficient to oxidize the carbon formed through thermal decomposition, or, although sufficient, the diffusion of the oxygen to the carbon is not fast enough, and is not being helped by the continued presence of hydrogen or dissociating water vapor, smoke will form depending on the circumstances. A probable mechanism appears to consist of initial dehydrogenation steps, or stripping hydrogen atoms from the hydrocarbon skeleton by successive reactions of free radicals or atoms (3). This is followed by decomposition to acelylene and hydrocarbon fragments which then undergo simultaneous polymerization and dehydrogenation to form smoke (8). A considerable amount of this finely divided smoke actually burns or is consumed by the flame. Knowing how smoke and carbon residues form should help us to provide means which will prevent it. This problem can be attacked from various directions.

FUELS

Some fuels are smokier than others, and the fuels which are smokier in Diesel engines are ordinarily also smokier in gas turbines and even in wick lamps.

(7) P. H. SCHWEITZER, *Must Diesel Engines Smoke?*, SAE Transactions, July, 1947.

(8) G. PORTER, *Carbon Formation in the Combustion Wave*, Fourth Symposium on Combustion, MIT, 1952.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The most important fuel property is its chemical composition. High carbon-hydrogen ratio and high carbon bond strength promote smoking tendency. Formaldehyde (CH_2O) and methyl alcohol (CH_3OH) never smoke, paraffinic fuels smoke less than naphthenic, and these less than aromatics. The more readily the hydrogen atoms are removed as compared to the breaking of carbon bonds, the greater the probability of smoke formation. Heavy fuels smoke more than light fuels and a more compact molecule has a higher smoking tendency than a loosely built molecule.

Another fuel property which influences smoking tendency is volatility. The more volatile fuel vaporizes faster which is essential to permit adequate oxidation to take place. The more the oxidation process can keep pace with the pyrolysis, the less carbon will form and the carbon which does form has more chance to oxidize and burn before it leaves the engine cylinder.

Operating conditions most conducive to smoke are, therefore, those which create a shortage of oxygen or reduce the excess air in a Diesel engine: overload, altitude, clogged air cleaner etc. (7).

ENGINE DESIGN

The greatest profit can be derived from the new knowledge in engine design. This is what Dr. Meurer did with spectacular success. He reasoned somewhat like this:

The problem is to introduce a certain amount of fuel into the cylinder and burn that fuel without noise and without smoke. Most of this fuel should bhrn at or near top center position of the piston to insure a good thermal efficiency.

The conventional answer was to atomize the fuel very finely and inject it when the piston is nearing top center position in such a manner that the spray will reach every cranny of the combustion chamber. By doing just that Meurer found that the engine was noisy and smoky. It is now easy to see why.

Fuel was injected into the engine cylinder and found air in it with a pressure of about 600 psi and a temperature of about 1000 F. When millions of droplets find themselves in such an environment they crack. Few of the hydrocarbon molecules that crack into carbon find adjacent oxygen molecules to combine with. The cracking and the ignition occur in an envelope surrounding the droplet near the liquid-vapor interface. But much of the oxygen never has a chance to get to this interface.

Making the spray finer may help but the droplets would have to be 10^{14} times smaller in volume to get them to molecular size which is obviously impossible.

A near thought is to vaporize the fuel outside and introduce it into the cylinder in vapor form. This is about what is done in a gasoline engine, but it cannot be done in a Diesel for two reasons. First, because no carburetor or vaporizer can handle Diesel fuel with a distillation range from 300 to 600 F. Second, even if we should get dry vapor into the cylinder it will fail to ignite by compression ignition. We must have either a spark plug or at least pilot spray of liquid fuel to ignite the cylinder charge.

If the fuel cannot be vaporized outside of the cylinder, Meurer reasoned, it must be vaporized inside the cylinder but under such circumstances that will discourage cracking. The cracking temperature is about 750-1000 F. So the problem is how to keep the fuel cool in the 1000 F air and make it evaporate before it becomes hot.

Meurer accomplishes this by smear-

(*Turn to page* 136, *please*)

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"SERVICE PISTON RINGS"
UNIT PISTON RING SET
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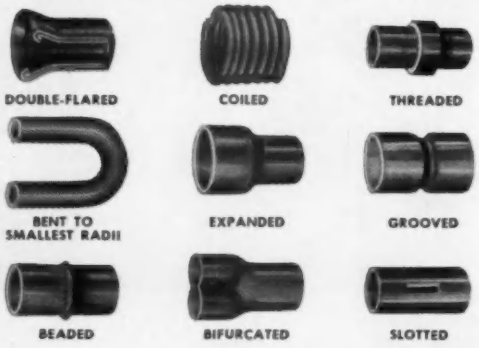

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A New Concept of Diesel Combustion

(*Continued from page* 133)

ing the fuel on a cool surface. The combustion chamber is formed by a hemispherical cavity in the piston which is cooled by an oil jet from underneath. The fuel is sprayed against the combustion chamber wall slightly downward at such an acute angle that it spreads out on the wall without bouncing off. The temperature of the oil film is above the vaporization temperature but below the cracking temperature, approximately 400 to 750 F. This is, of course, much too low to vaporize all of the fuel during a small fraction of the cycle. This is accomplished by exposing the thin layer of liquid fuel to hot wind immediately and to hot radiation later. The fuel will then evaporate fast enough to finish combustion in time.

The one practical way to provide wind in the combustion chamber is by creating an air swirl. This swirl must be of the persistent type and must last after the reversal of piston motion. To accomplish this the air is introduced tangentially into the cylinder through masked valve or a "twisted" port. In this way Meurer obtains an air swirl 2-3 times engine rpm. To this he adds "squish" by keeping the clearance between piston rim and cylinder head minimum (see cutaway view of engine), and so squeezing the air from the periphery to the center. In this manner a swirl which is 6 times engine rpm can be obtained, sufficient for fast initial vaporization of the fuel. To make most of the fuel adhere to the combustion chamber wall it is injected in the direction of the air swirl.

The remaining problem is how to ignite the charge. Combustible gases and dry vapors are reluctant to ignite spontaneously but they can be ignited easily by an external source. A fine spray, on the other hand, ignites readily in hot air.

One could provide a fine spray, off the combustion chamber wall, while most of the fuel is made to impinge upon it. Alternatively the very same jet or jets which are directed to the wall, by first traversing a short air gap, shed some finely atomized droplets which float in the air and ignite before they reach the solid wall. A few of these ignition nuclei are sufficient to ignite the vapor formed by the evaporization of the fuel film.

Now we have a Diesel combustion system which works as follows:

During the intake stroke the air enters with a directional guidance so that it begins to rotate in the cylinder around the axis. This rotation persists during the compression stroke and is even augmented near the end of the stroke by the squish produced by the small (appror. 1/32 in.) clearance between the piston rim and the cylinder head.

The piston has a hemispherical combustion chamber with a diameter about ½ of the cylinder bore. As the piston approaches top center on its compression stroke, there exists a vigorous air swirl (approx. 6 x rpm) in the hemispherical chamber.

Some 20 deg before top center an obliquely located injector sprays two jets at an acute angle to the wall of the combustion chamber, in the direction of the air rotation, bent a little down. Some 95 per cent of the injected fuel impinges on the wall while some 5 per cent become atomized and dispersed.

Shortly before the piston reaches its top center position ignition occurs in

(*Turn to page* 140, *please*)

PARTS by the thousands

cleaned and deburred automatically

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automatic media return tumbling barrel

widely adaptable for

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Media is retained in drum, eliminating costly hand separation and loss of media.

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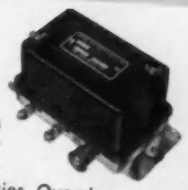

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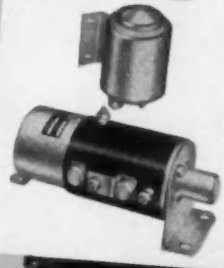

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Long life contacts handle high current. Splash-proof construction. Designed for highest reliability.

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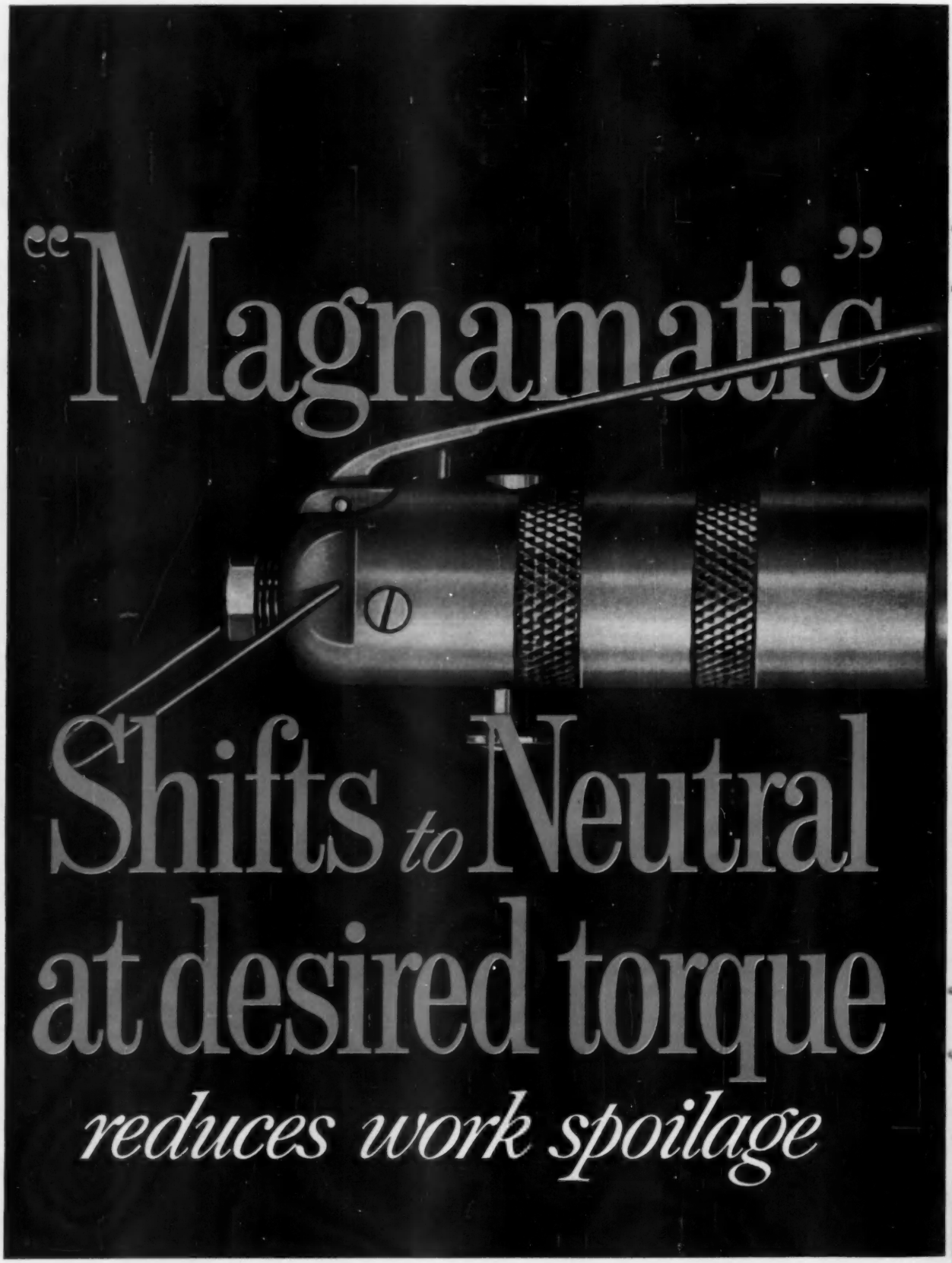
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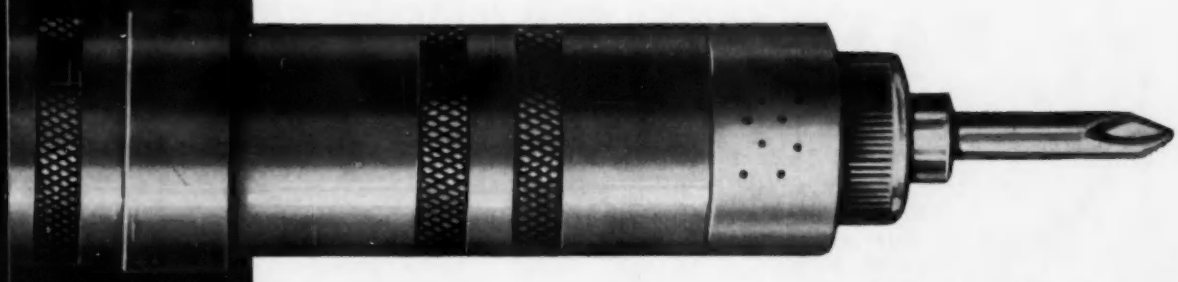

The instant a "Magnamatic" air-driven screwdriver-nutrunner reaches desired torque its automatic "One-Shot" clutch shifts to neutral. There's no harmful hammering, impacting or ratcheting to run fasteners past proper tightness and to damage surfaces, break bits, burr screw heads, strip threads or shear fasteners. And "Magnamatic" is *Quiet* . . . clutch buzz is eliminated and exhaust noise is muffled by a new principle of baffling. For complete details call your Chicago Pneumatic sales office or mail coupon.
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Lafayette,
Indiana

A New Concept of Diesel Combustion

(*Continued from page* 136)

the atomized spray. The rest of the fuel, helped also by the air swirl, gets spread on the combustion chamber wall in the form of a thin liquid film about ¾ around. The hot air scrubbing this liquid film makes it begin to evaporate. It is helped by the warm combustion chamber wall which, however, must be below the cracking temperature, around 750 F minimum.

A layer of vapor forms now adjacent to the combustion chamber wall which is promptly ignited by the ignition nuclei of the atomized 5 per cent spray. As this vapor layer burns it transfers heat to the liquid film and accelerates the evaporation. The vapor mixes intimately with the still swirling air and burns almost as soon as it is formed. Whatever carbon is produced by thermal decomposition, it is consumed in the "premixed" flame through intimate contact with the oxygen. So the fuel burns clean, even with only a moderate amount of excess air, without exhaust smoke and with a minimum amount of carbon deposits in the engine.

The M-engine has no Diesel knock. The fuel which is in the form of a liquid film will not ignite, only the 5 per cent atomized portion. As the film successively evaporates it burns. This is a gradual process. It starts slowly because the fuel film is still cold and the relative velocity between the liquid film and the air swirl is small. Then it gains momentum as it gets along. The radiation from the already burning vapor vaporizes the fuel more rapidly. It is also helped by the increasing wind velocity. The air swirl does not become faster but the motion of the liquid film is slowed down by the wall friction. The further the combustion progresses the higher the rate of burning becomes. This helps to clean up combustion near its end. Most of the fuel ignites after top center and never a great amount at any one time.

This revolutionary engine invented by Dr. S. Meurer of MAN Co. in Germany, burns clean, runs quietly, and has excellent power output and fuel economy. Furthermore, it can burn with equal ease Diesel fuel, kerosene, gasoline, jet fuel and other light and middle distillates. (See description of the MAN engine in AUTOMOTIVE INDUSTRIES, Nov. 1, 1949, and Aug. 15, 1954.)

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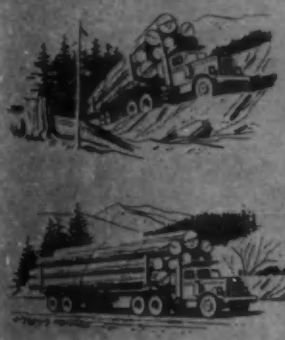

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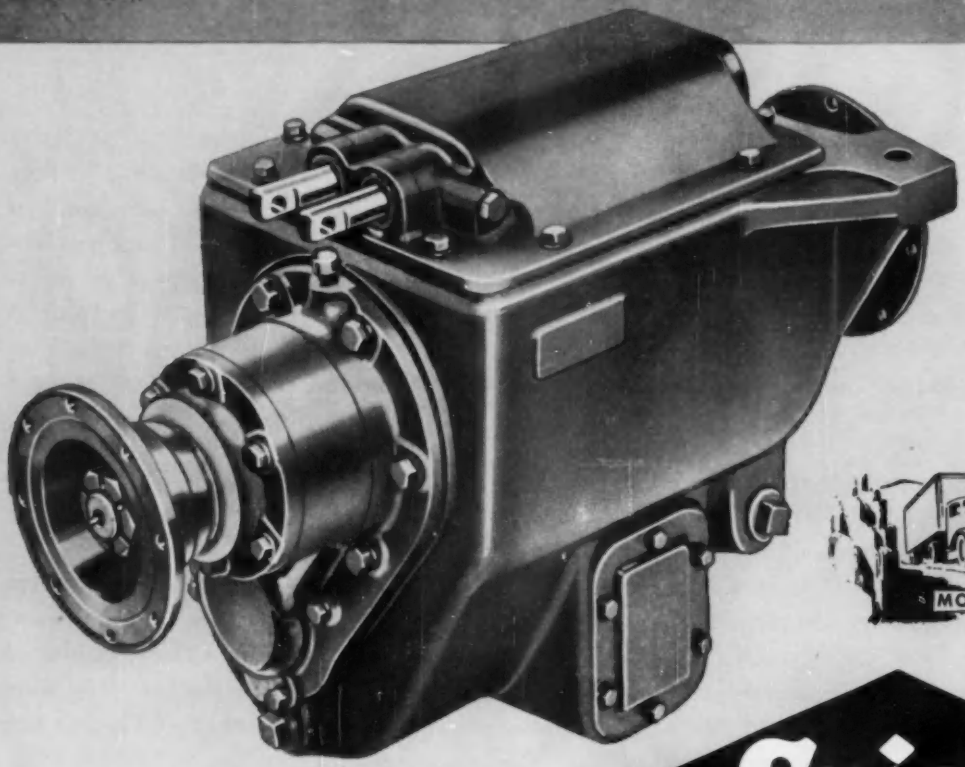

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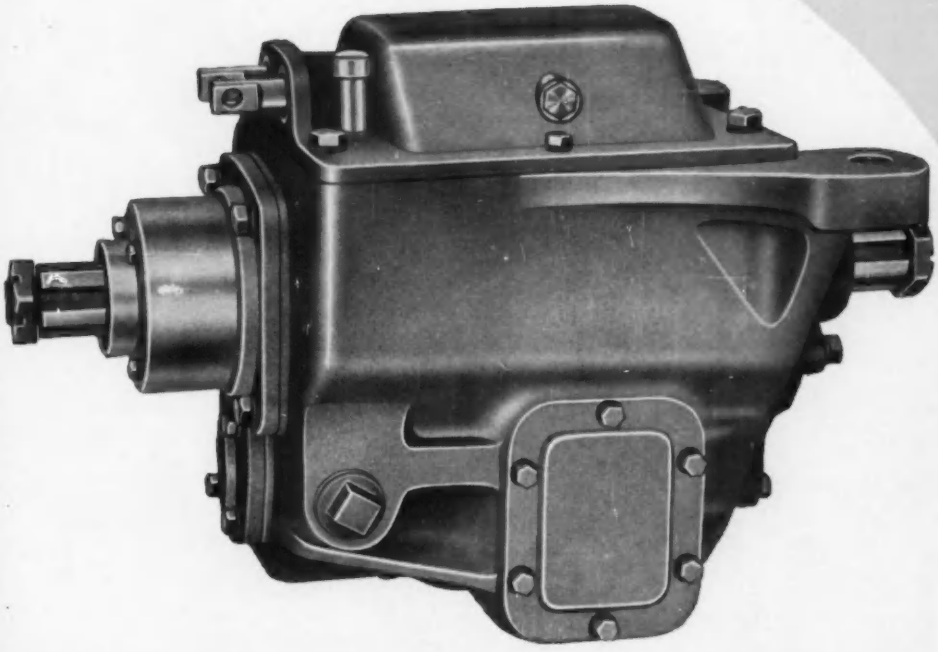
OPEN ROAD

HILLY COUNTRY



EASIER MANEUVERABILITY

HEAVY HAULING

LIGHT LOADS

Here's another Spicer innovation in auxiliary transmission design for more efficient truck operation . . . a deep underdrive and splitter ratios in *one gear box!*

This means plenty of power for tough operating conditions when *off-the-highway* on any terrain.

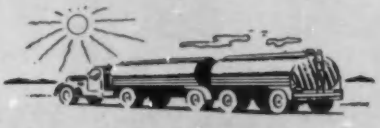
And it means plenty of speed for fast *on-the-highway* operation!

Another important feature: these new Spicer 4-Speed Auxiliaries have exactly the same overall length as Spicer 3-Speed Auxiliaries. They can be installed in the same vehicle without change in companion flanges or drive-line length. And they have the same shift lever controls as the 3-speed units.

A top-mounted power take-off capable of transmitting full engine torque is available for use with the new Spicer 4-Speed Auxiliaries.

HEAVY TRAFFIC

WINTER



SUMMER

FLAT LAND

EMPTY

SPICER PRODUCTS: TRANSMISSIONS • UNIVERSAL JOINTS • PROPELLER SHAFTS • AXLES • TORQUE CONVERTERS • GEAR BOXES • POWER TAKE-OFFS
POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES • STAMPINGS • SPICER and AUBURN CLUTCHES • PARISH FRAMES • SPICER FRAMES

More Government Contract Awards

(*Continued from page* 128)

GENERAL MOTORS CORP., Allison Div., Indianapolis, Ind.
XT-1400-2A transmission spare parts—various— $38,952
Valve, control, transmission assembly, hub, steering, clutch, inner assembly—956—$162,520
Transmission assembly—12 ea.—$204,000

GENERAL MOTORS CORP., Chevrolet Motor Div., Detroit, Mich.
Station wagons—6 ea.—$10,030
Trucks—49 ea.—$109,089
Light trucks—102 ea.—$139,866
Automobiles—18 ea.—$22,581
Parcel delivery trucks—500 ea.—$1,117,895

GENERAL MOTORS CORP., Detroit Diesel Engine Div., Detroit, Mich.
Diesel engine—14 ea.—$143,059

GENERAL MOTORS CORP., GMC Truck & Coach Div., E. Pontiac, Mich.
Bus—1 ea.—$24,798

GENERAL MOTORS CORP., United Motor Service Div., Detroit, Mich.
Starter—1452 ea.—$55,425

Hardened and Ground Parts are our *Specialty*

This king pin is truly king-size: 8" long and weighs about 12 lbs. We machined it out of No. 3140-2⅞" bar steel. After heat treating, bearing surface was given the specified fine finish-grind to 2½" dia., +.000 —.001.

Parts like this are our specialty—we've been making them exclusively for the automobile industry for more than 40 years. Each year has added to our knowledge and skill in precise machining, scientifically-controlled heat treating and micro-finish grinding. Let us show you what we can do with one of your tough jobs. Write or wire.

Henry W. Brown
PRESIDENT

Experienced production on:
King Pins • Wheel Studs
Shackle Bolts • Shackle Pins
Brake Anchor Bolts
Countershafts • Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
5th-Wheel Rocker Shafts
Water Pump Shafts
. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

THE BROWN CORP.
213 BELLEVUE AVE. SYRACUSE, N. Y.
C. H. Ehlert, 3407 Clarendon Rd., Cleveland • N. F. Spring, 4718 Belfour Rd., Detroit • R. C. Sanderson, 5651 N. Ashland Ave., Chicago • Harry J. Windmiller, 1704 Carlton, Fort Worth • Lyle H. Johnson, 1356 Westwood Blvd., Los Angeles, Calif. • John B. Hunt, 5011 S.E. Yamhill St., Portland, Ore.

THE GENERAL TIRE & RUBBER CO., Akron, Ohio
Tire, 7.50 x 20—33,000 ea.—$808,500
Wheel assys.—1285 ea.—$57,568

THE B. F. GOODRICH COMPANY, Akron, Ohio
Tires, 7.50 x 20—9820 ea.—$249,395
Wheels: main—248 ea.—$291,914
Hose: rubber aircraft—various—$168,558

THE GOODYEAR TIRE & RUBBER CO., INC., Akron, Ohio
Brake assemblies, wheel assemblies—3023—$551,636

HOLLEY CARBURETOR COMPANY, Van Dyke, Michigan
Parts to support J57-P37 engines valves—$57,738
Maintenance parts used to support fuel controls and valve assys.—various—$189,517
Maintenance parts to support control fuel—various—$121,143
Engine spare parts—1271 ea.—$91,334
Engines and parts—various—$163,957

HOUDAILLE INDUSTRIES, INC., Buffalo Hydraulic Div., Buffalo, New York
Shock absorber—1514 ea.—$44,285

THE FRANK G. HOUGH CO., Libertyville, Illinois
Tractor, aircraft spotting, gasoline, 15,000 lb.—130 ea.—$1,003,375

INTERNATIONAL HARVESTER CO., Washington, D. C.
Parcel delivery trucks—200 ea.—$458,428
Trucks—3 ea.—$14,474

INTERNATIONAL HARVESTER CO., Chicago, Illinois
Truck, chassis and cab, 3 ton; truck tractor, 5 ton; truck, cargo, 3 ton; cargo van, 3 ton—105—$434,420

INTERNATIONAL HARVESTER EXPORT CO., Washington, D. C.
Trucks—15—$75,825

INTERNATIONAL HARVESTER EXPORT CO., Chicago, Illinois
Tractors, crawler—2 ea.—$41,875

JACOBS AIRCRAFT COMPANY, Pottstown, Pa.
Coupling assy. spring—48 items—$300,884
Bearing assembly cam shaft rear—1 item—$190,255

McDONNELL AIRCRAFT CORP., St. Louis, Missouri
Parts for F2H aircraft—various—$60,006

NORTHRUP AIRCRAFT, INC., Hawthorne, Calif.
Repair and reconditioning of aircraft—$379,849

PRATT & WHITNEY CO., Chandler Evans Div., West Hartford, Conn.
Parts for carburetors—various—$49,719

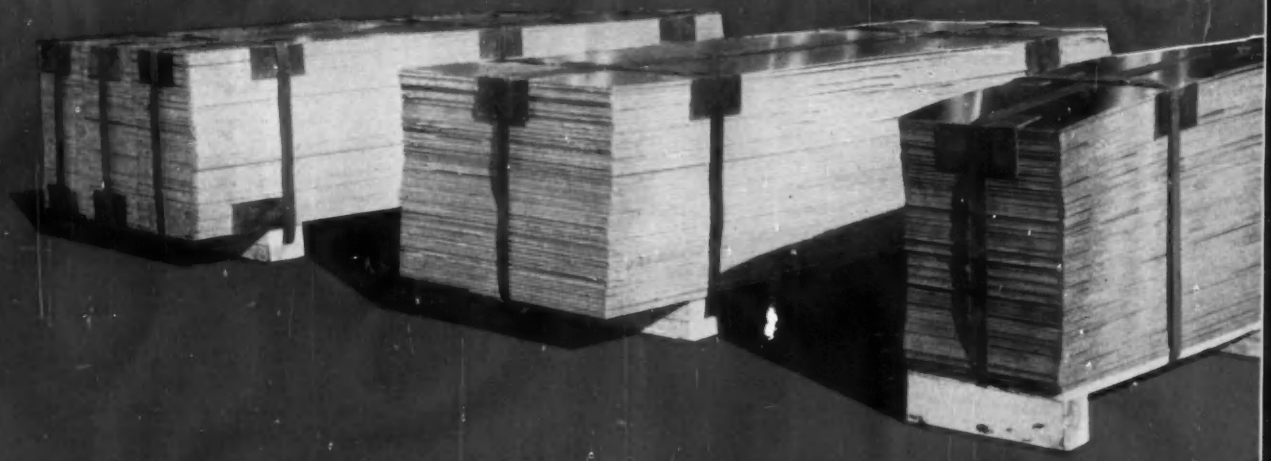
Rover Company, LTD., Warwickshire, England
Trucks—21—$47,242

SOUTHERN COACH MANUFACTURING CO., INC., Evergreen, Alabama
Bus—26 ea.—$316,914

STEWART-WARNER CORP., South Wind Div., Indianapolis, Ind.
Heater w/o blower, igniter assy.—2351—$26,670

THOMPSON PRODUCTS, INC., Accessories Div., Cleveland, Ohio
Pump assembly—1 item—$145,635
Housing assy. valve—87 items—$201,772
Shaft fuel pump turbine drive—91 items—$226,576
Rotor assembly-fuel pump—173 items—$279,896

(*Turn to page* 148, *please*)



one call... Ingersoll...

for all these special steels

PHONE
132

• carbon electric steel for tractor clutch discs • alloy steels • auto clutch plate steels • tillage steels • soft center steel • knife steels • saw steels, including high speed hack saw blade steels • Tem-Cross steel • heat-resisting steels • stainless steels • IngArched stainless-clad steel • forging quality electric steel ingots • farm implement disc blades

Ingersoll
STEEL DIVISION

BORG-WARNER CORPORATION, NEW CASTLE, INDIANA

*BORG-WARNER TRADE MARK

"Operations Kingsbury" —another way of saying

Drilling holes for lubrication in a rocker arm malleable iron casting is not exactly a *precision* job . . . *but the holes must go thru!* And high production is also a *must*.

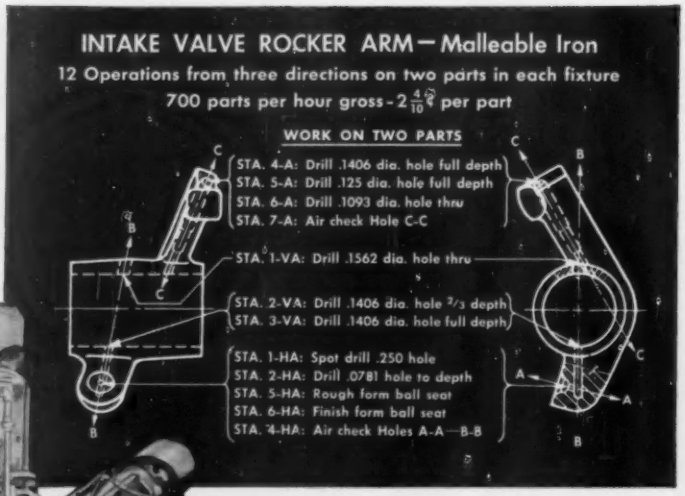
The part required four holes and a ball socket, developed at angles as shown on the print below. To obtain the highest practicable output, we used multiple spindle heads to perform identical operations on two parts at each station. Each work-holding fixture secured two parts in position so that all holes could be completed at the correct angles in one chucking.

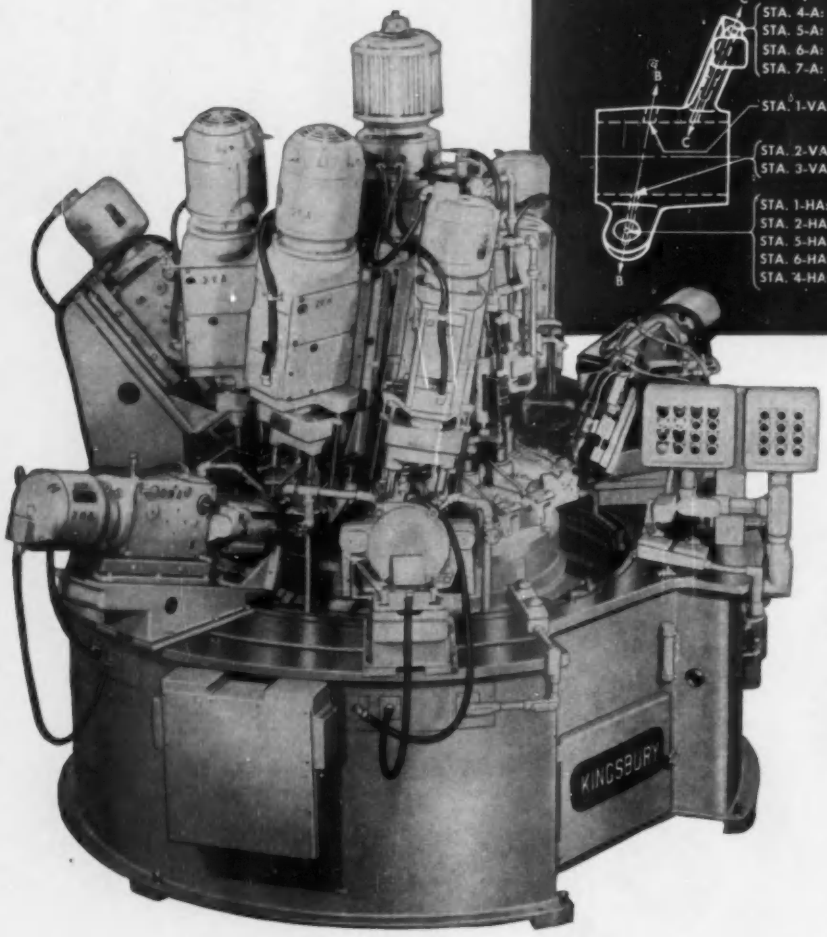
Seven work units are mounted on a 100-inch base. Eight twin work-holding fixtures are mounted on a 40-inch table, which indexes through 8 stations — one for loading and unloading. The central column is stationary. Machine includes coolant pump and chip tank assemblies.

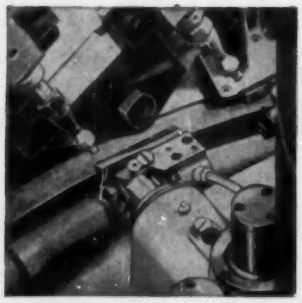
Holes B-B and C-C are drilled in three stages so as to minimize "loafing time" at any station. At Hole B-B, *Sta. 1-VA* drills into the rocker shaft hole. At *Stas. 2-VA* and *3-VA*, a bushing, assembled into the shaft hole stud, guides the drill accurately across this break-thru. Hole C-C is drilled at *Stas. 4-A, 5-A and 6-A*. At *Stas. 1-HA, 2-HA, 5-HA and 6-HA*, units drill Hole A-A and form the ball socket.

To make sure that Hole C-C breaks through into the shaft hole, it is air-checked at *Sta. 7-A*. The junction of Holes A-A and B-B is air checked at *Sta. 4-HA*. Back pressure stops the machine.

The customer got exactly what he wanted: high production at low cost per part.


INTAKE VALVE ROCKER ARM — Malleable Iron
12 Operations from three directions on two parts in each fixture
700 parts per hour gross - 2 4/10 per part
WORK ON TWO PARTS
STA. 4-A: Drill .1406 dia. hole full depth
STA. 5-A: Drill .125 dia. hole full depth
STA. 6-A: Drill .1093 dia. hole thru
STA. 7-A: Air check Hole C-C
STA. 1-VA: Drill .1562 dia. hole thru
STA. 2-VA: Drill .1406 dia. hole 2/3 depth
STA. 3-VA: Drill .1406 dia. hole full depth
STA. 1-HA: Spot drill .250 hole
STA. 2-HA: Drill .0781 hole to depth
STA. 5-HA: Rough form ball seat
STA. 6-HA: Finish form ball seat
STA. 4-HA: Air check Holes A-A — B-B





Sta. 7-A: Note the two air nozzles which check for full break-thru of Hole C-C and the rocker shaft hole. Similar operations are performed at Sta. 4-HA on Hole A-A which connects with Hole B-B.

"OK in every way" for low-cost, high production

Here's another Kingsbury machine with several unusual features. Print called for eight countersunk holes, spaced equally around a flange. To insure smooth seating, these holes had to be burred. This required an operation from the back of the part.

The machine has an 80-inch base with four work units. The 26-inch table has five work-holding fixtures and indexes through five stations — one for loading and unloading.

The part is located on a horizontal mandrel through the axis hole, and is clamped in position by means of two fingers, 180° apart. These fingers are operated by an equalizing cam: they clamp and unclamp automatically. Each Kingsbury head has 8 spindles, and all operations are performed horizontally.

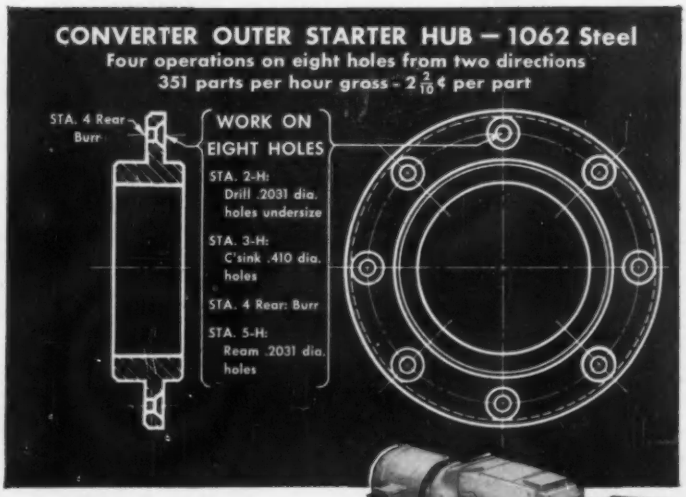
The eight holes are burred at *Sta. 4 Rear.* Here an auxiliary eight-spindle unit is supported by a bridge extending across the table.

* *

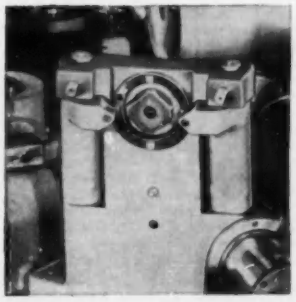
Kingsbury heads, and fixtures, working as a team, can perform an amazing number of multiple operations. Case history after case history proves that this team work is a prime reason why Kingsburys, built here in Keene, develop accuracy and high production at low cost per part.

Today there are many more reasons why a Kingsbury might quickly pay for itself in your production line. Let's talk it over.

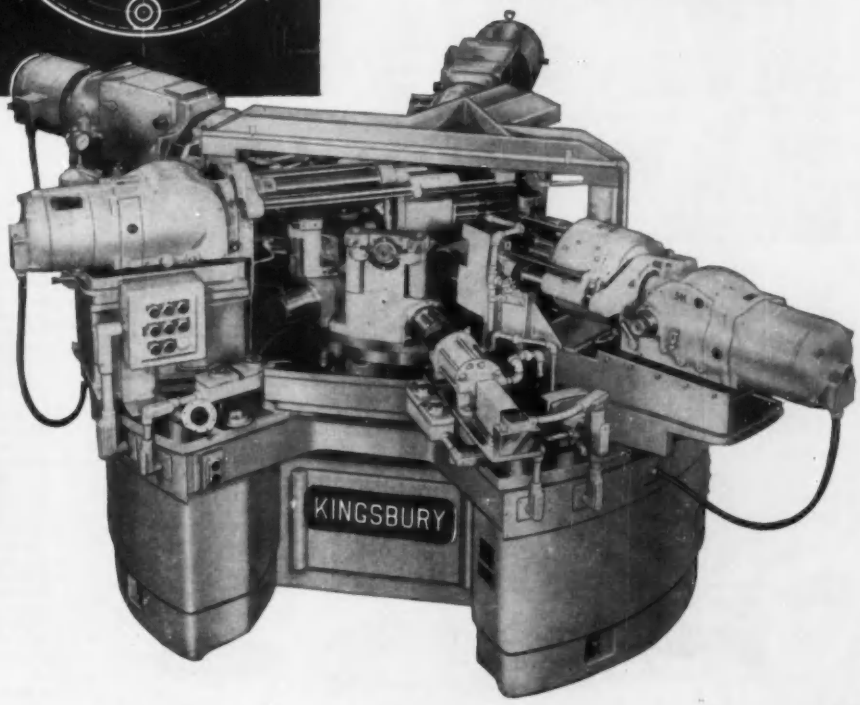
Kingsbury Machine Tool Corp.
116 Laurel St., Keene, N.H.


CONVERTER OUTER STARTER HUB — 1062 Steel
Four operations on eight holes from two directions
351 parts per hour gross - 2 2/10¢ per part
STA. 4 Rear Burr
WORK ON EIGHT HOLES
STA. 2-H: Drill .2031 dia. holes undersize
STA. 3-H: C'sink .410 dia. holes
STA. 4 Rear: Burr
STA. 5-H: Ream .2031 dia. holes

KINGSBURY
AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production



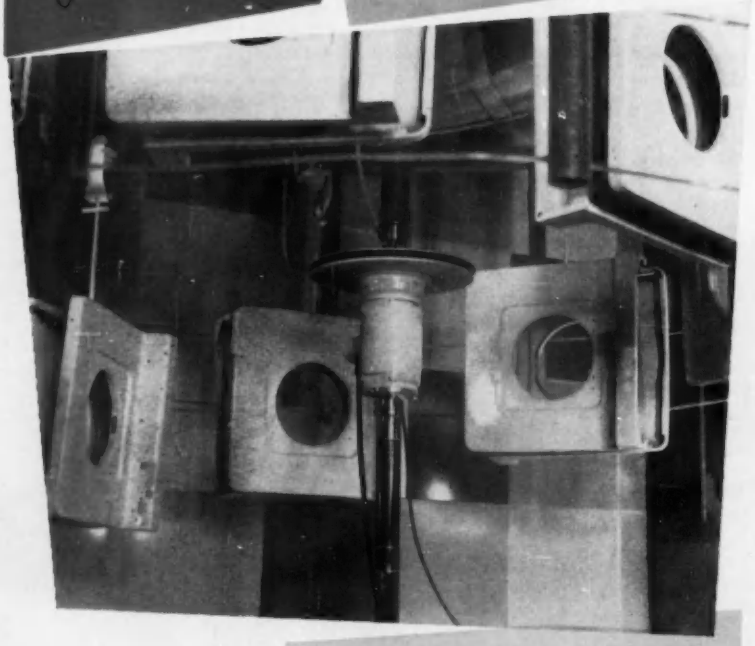
Fixture at *Sta. 5* where it is loaded and unloaded. Note the fingers which clamp the part firmly against the face of the fixture.



NOW

for the first time...

PORCELAIN ENAMEL
is being applied successfully—
Yes, even spectacularly—
with RANSBURG NO. 2 ELECTROSTATIC SPRAY PROCESS



General Electric—an ettensive user of Ransburg Electro-Spray for painting with synthetic enamels—is the first to use Ransburg No. 2 Process in the application of porcelain enamel.

GE—less than a year in electrostatic production—now is processing almost a million square feet of cover coat each month in the General Electric Home Laundry finishing department at Appliance Park.

DRYER TOPS AND WASHER COVERS ARE BEING COATED ELECTROSTATICALLY WITH THESE SPECTACULAR RESULTS

Quality of appearance and chip resistance are greatly improved with all colors: white, yellow, pink, turquoise, blue and brown.

About 97% of the atomized enamel is deposited on the washer and dryer parts.

Because of improved uniformity in coating thickness, weight of applied enamel was substantially reduced.

Because of lower application weight, the few rejected parts can be re-processed more times before being scrapped. This reduces the ultimate scrap rate by at least 95% of that previously expected.

Efficiency, measured by the amount of good ware, averages above 90%.

Want your products tested?

Ransburg has fully equipped laboratory facilities including reciprocating disks, helical conveyors, stationary disks, and the latest advancements in equipment for applying porcelain enamel with the No. 2 Electrostatic Spray Process. Manufacturers are invited to send sample products to our Indianapolis laboratories for tests and demonstrations to prove for you the advantages and benefits of electrostatic spray application of porcelain enamels.

Ransburg ELECTRO-COATING CORP.
Indianapolis 7, Indiana

RANSBURG

(Continued from page 144)

TOWMOTOR CORPORATION, Cleveland, Ohio
Truck, fork lift, gasoline, 4000 lb. cap.—270 ea.—$788,460

UNITED AIRCRAFT CORP., Hamilton Standard Div., Windsor Locks, Conn.
Servicing propeller blades—690 ea.—$137,274
Service pump assys.—167 ea.—$40,580

VERTOL AIRCRAFT CORP., Morton, Pa.
Spare parts for HUP-2 and -2S aircraft—various—$287,159

WAUKESHA MOTOR COMPANY, Waukesha, Wisconsin
Auxiliary power plants—175 ea.—$259,238

WEATHERHEAD COMPANY, Cleveland, Ohio
Shell, heat, M344, 106 mm—$1,181,280

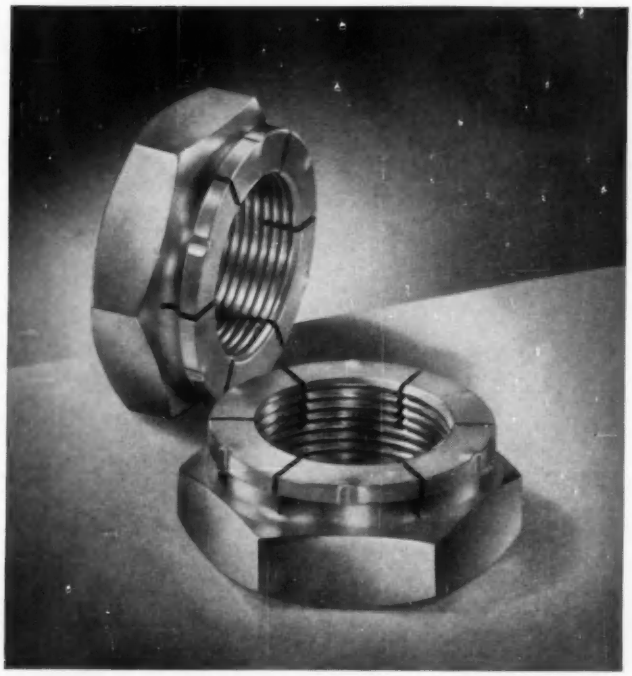
WILLYS MOTORS, INC., Toledo, Ohio
Truck, mounted audio visual units—24—$81,295

BOOKS . . .

THE AIRCRAFT YEAR BOOK, 1955, *published by Lincoln Press, Inc., 1143 National Press Building, Washington 4, D. C. Price, $6.00.* The thirty-seventh edition of this year book reports on all the major activities of the aircraft industry, the Air Force, Naval Aviation, the Marine Air Arm, and Army Aviation. It reviews the progress of the commercial airline, which last year flew some 42 million passengers over 24 billion passenger miles; and of utility aircraft, which serve business, industry and agriculture. It covers the development of the helicopter, from the commercial as well as the military aspect. Included also are a complete directory of information sources, executives, and agencies in U. S. aviation; a complete chronology of U. S. aviation history from 1784 to the present; a photographic record of outstanding aviation events during the year; and a description of airplanes currently in production, with photographs and 3-view drawings.

THEORY OF COMBUSTION INSTABILITY IN LIQUID PROPELLANT ROCKET MOTORS, *by Luigi Crocco and Sin-I Cheng, published by Butterworths Scientific Publications, 250 Fifth Ave., New York 1, N. Y. Price, $5.25.* The authors of this highly technical monograph have set for themselves the task of explaining some of the underlying processes responsible for the turbulent conditions found in the combustion chambers of rocket motors. They list as some of the detrimental effects of combustion roughness such conditions as severe vibration or interference with controls and safety devices; mechanical failures of parts of the rocket or of the accessory systems; and thermal failure (burn out) of some parts of the internal rocket walls. In attacking the problem, the authors have taken a deductive approach. In other words, they have attempted to make use of the present knowledge of the combustion process to explain the detrimental and non-detrimental types of rough combustion; to distinguish a number of mechanisms which may be responsible for the appearance of the detrimental type; to give for some of these mechanisms plausible quantitative formulations; and, finally, to analyze in detail the results of the theoretical developments.

Flexloc thin nuts save space, weight and production time



Self-locking nuts are 30% lower and lighter; speed up assembly with hand or power tools

Self-locking FLEXLOC thin nuts are 30% lower than regular height locknuts of the same nominal diameter. They fit into spaces where regular height locknuts will not go. You can design lighter, more compact units with them.

Where you must reduce weight in a completed assembly, you can save by using shorter bolts with these lighter nuts. And you save production time. The length of engagement of mating threads is shorter: fewer revolutions of hand wrenches or power nut runners are needed to seat them.

FLEXLOC nuts are of 1-piece, all-metal construction. You can use a FLEXLOC fully seated as a locknut or at any point along a bolt as a stop nut. Once the threads in the resilient locking section are fully engaged, the FLEXLOC grips the mating threads with uniform locking torque wherever wrenching stops. Since there are no nonmetallic inserts to come out or deteriorate, the locking life of a FLEXLOC is virtually unlimited.

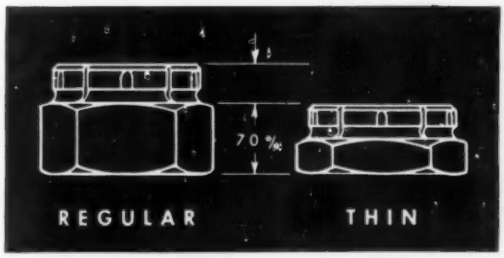
Your authorized industrial distributor stocks FLEXLOC nuts in a variety of sizes, materials and finishes. Consult him for details. Or write us for information about your special locknut problem. Flexloc Locknut Division, STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.

SPECIFICATIONS
FLEXLOC THIN NUTS

NATIONAL COARSE THREAD—U.S.S

SIZE	A INCHES	H INCHES	WIDTH ACROSS CORNERS	WEIGHT PER 1000 NUTS
6-32	.312	.125	.361	1.8
8-32	.344	.172	.397	2.8
10-24	.375	.172	.433	3.3
¼-20	.438	.203	.505	5.4
5/16-18	.563	.250	.649	11.6
⅜-16	.625	.265	.722	14.9
7/16-14	.750	.312	.866	24.9
½-13	.813	.312	.938	28.4
9/16-12	.875	.359	1.010	36.1
⅝-11	1.000	.391	1.155	54.1
¾-10	1.125	.406	1.299	69.2
⅞-9	1.312	.469	1.516	107.5
1-8	1.500	.563	1.732	171.6
NATIONAL FINE THREAD—S.A.E.				
6-40	.312	.125	.361	1.8
8-36	.344	.172	.397	2.8
10-32	.375	.172	.433	3.3
¼-28	.438	.203	.505	5.4
5/16-24	.500	.250	.577	8.7
⅜-24	.563	.266	.649	11.5
7/16-20	.625	.312	.722	14.9
½-20	.750	.312	.866	21.7
9/16-18	.875	.359	1.010	36.2
⅝-18	.938	.391	1.082	42.4
¾-16	1.063	.406	1.227	54.5
⅞-14	1.250	.469	1.443	84.6
1-14	1.438	.563	1.660	136.3
1 1/16-12*	1.625	.625	1.876	193.5
1 1/16-12*	1.813	.750	2.093	296.0
1 3/16-12*	2.000	.812	2.309	389.0
1 ½-12*	2.187	.875	2.526	498.0

*Steel only (plain or cadmium plated) in stock sizes.



FLEXLOC thin nuts are 30% lower than regular height locknuts. There is a corresponding saving in weight. In sizes through 5/16 in., thin FLEXLOCS meet tensile strength requirements for regular height locknuts. FLEXLOC nuts can be made in the thin type because every thread, even those in the locking section, carries its full share of the load. There are no nonmetallic inserts to waste head space or weaken the structure of the nut.

Standard FLEXLOC self-locking thin nuts are available in plain or cadmium plated alloy steel, for use in temperatures to 550°F; in plain or silver plated corrosion resisting steel, for temperatures to 750°F; and in brass and aluminum, for temperatures to 250°F.

STANDARD PRESSED STEEL CO.
FLEXLOC LOCKNUT DIVISION SPS
JENKINTOWN PENNSYLVANIA

AUTOMOTIVE . . . New Danly Underdrives form the car bodies of tomorrow—at lower cost for a highly competitive market.

Danly

presses produce more

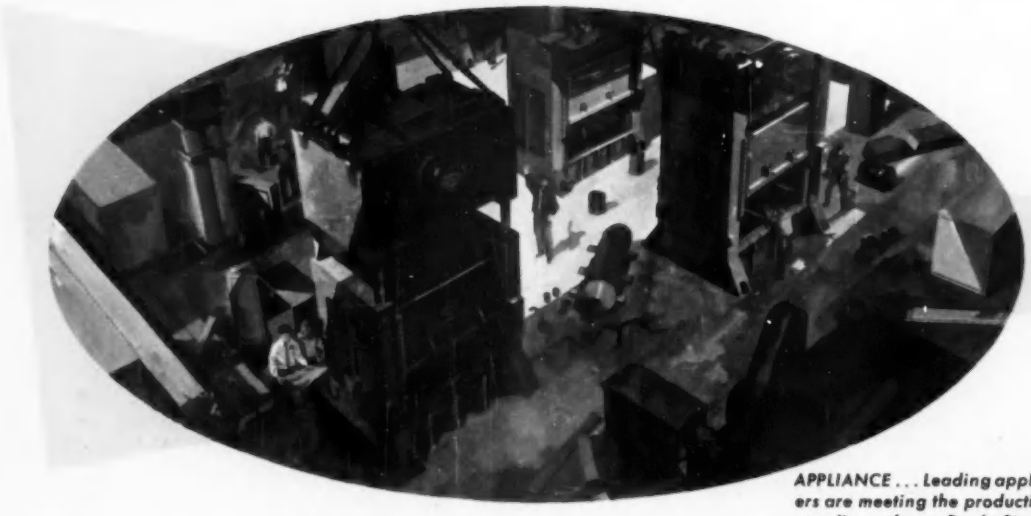
With Competition at an All-Time High, Successful Production Programs Are Being Built Around the Cost-Saving Advantages of Danly Presses

There are three basic reasons why leading industries invest millions of dollars each year in Danly Presses: 1) Engineering leadership, 2) Performance, 3) Dependability.

Engineering leadership—In new mechanical features, in safety, in operating efficiency . . . Danly has set the engineering pace. Every Danly Press is designed to meet specific, current production needs.

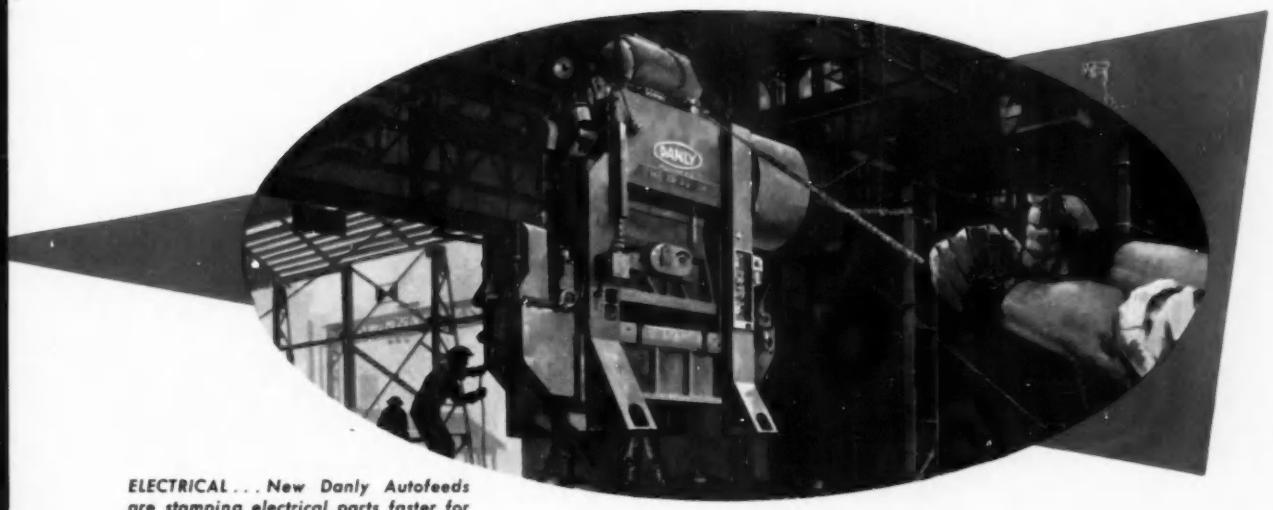
Performance—Each press type features all of the famous Danly advantages: extra rigid, balanced, precise construction; completely automatic oil lubrication system; cool-running clutch that lasts many times longer than conventional types; exclusive Danly control arrangements that promote operator safety and minimize accidental press damage.

Dependability—Danly engineering and construction pays off in more stampings over a longer period of time. Performance records in the largest shops prove that Danly Presses require less maintenance, greatly reduce need for spare parts.



APPLIANCE . . . Leading appliance manufacturers are meeting the production challenge with new lines of new Danly Straight Side Presses.

in every industry



ELECTRICAL . . . New Danly Autofeeds are stamping electrical parts faster for less—with longer die life.

. . . at lower cost

Send for these Danly Catalogs . . .

They Hold the Answer to Modern Mass-Production Stamping Problems

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

DANLY®

SKF® Has Them All

If you want to be *sure* you are putting the right bearing in the right place in your product, check with SKF—the *one* bearing manufacturer selling all four major types of anti-friction bearings. From this single source, you quickly and easily get unbiased advice based on the broadest experience in the anti-friction field. **SKF INDUSTRIES, INC.**, PHILADELPHIA 32, PA.

7710

SKF

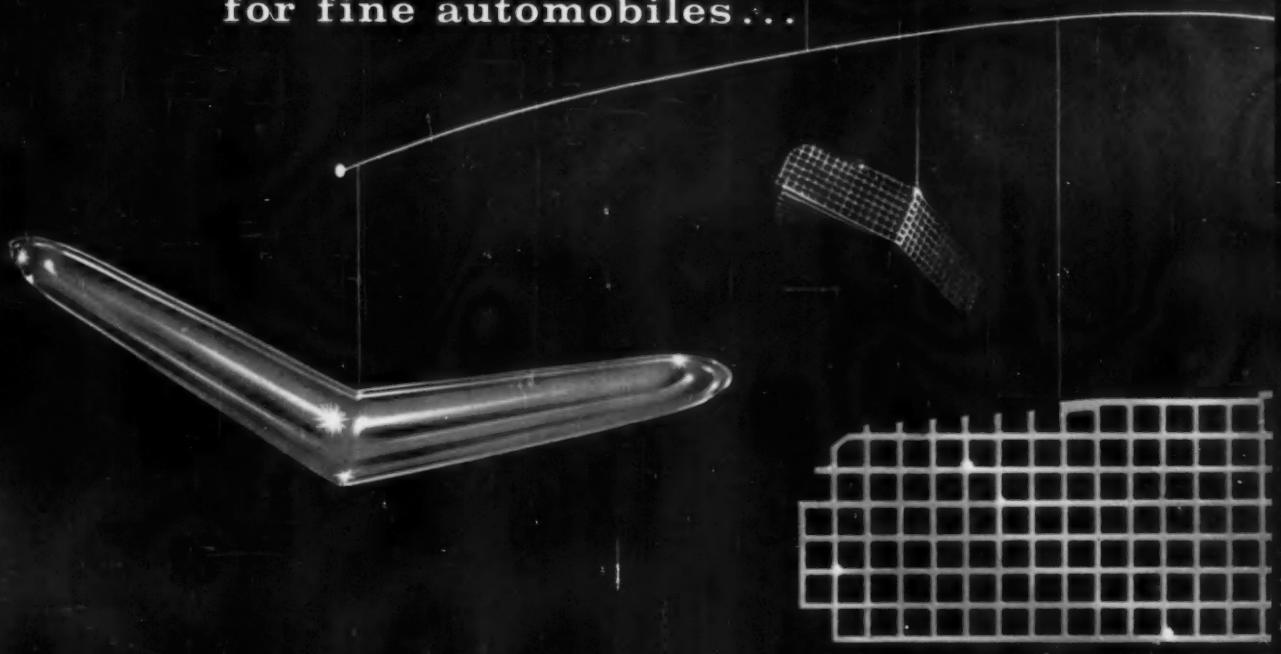
Ball Bearings Cylindrical Roller Bearings
Spherical Roller Bearings Tyson Tapered Roller Bearings

There's lasting beauty in

COLOR ANODIZED

trim parts fabricated and finished

for fine automobiles...

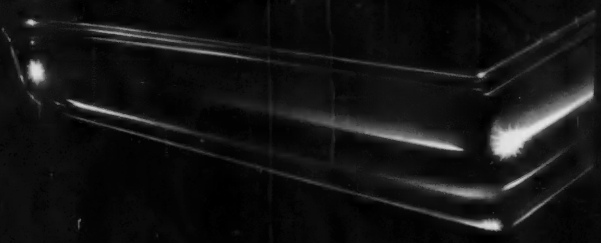


by

REYNOLDS ALUMINUM

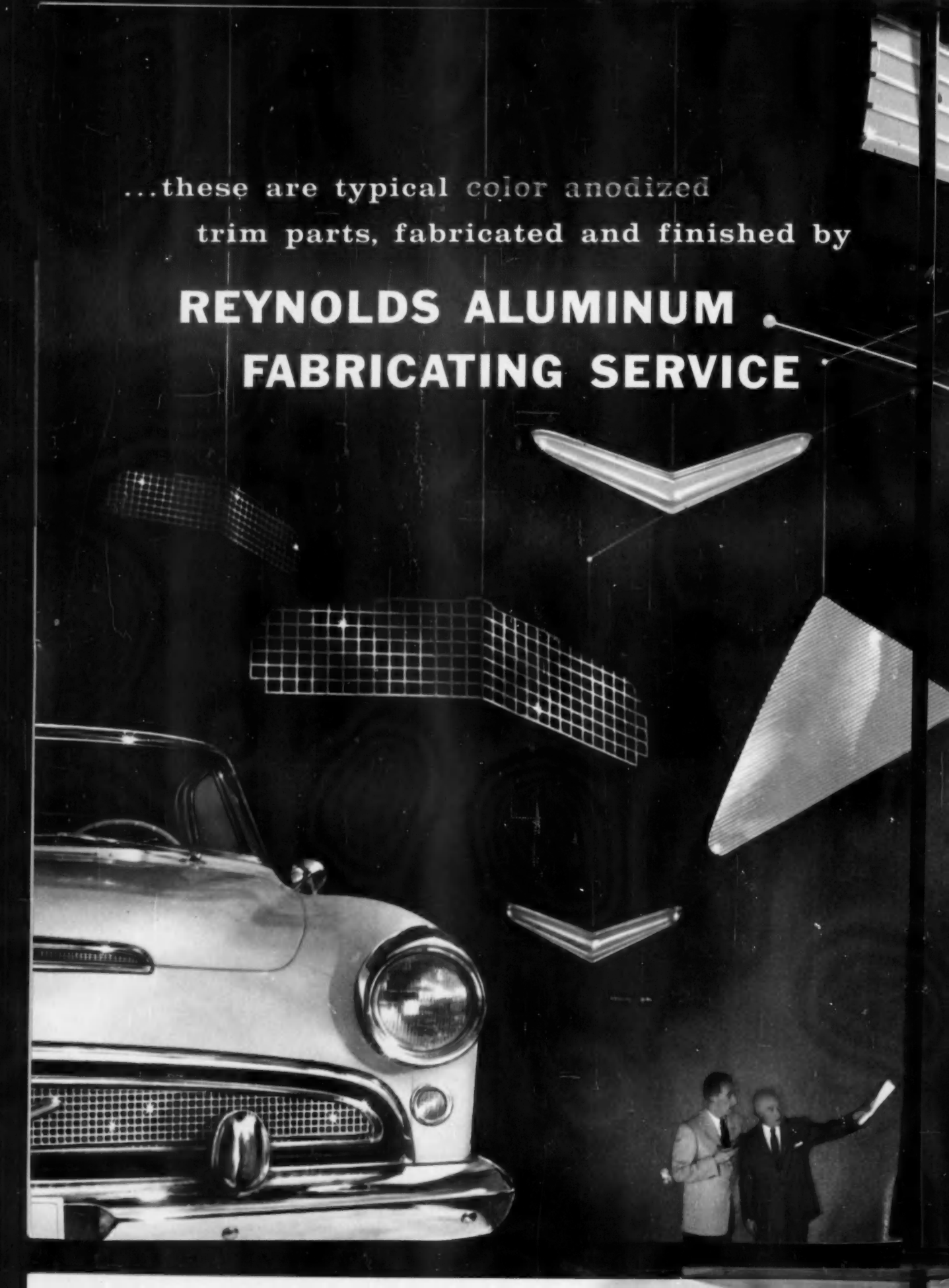
FABRICATING

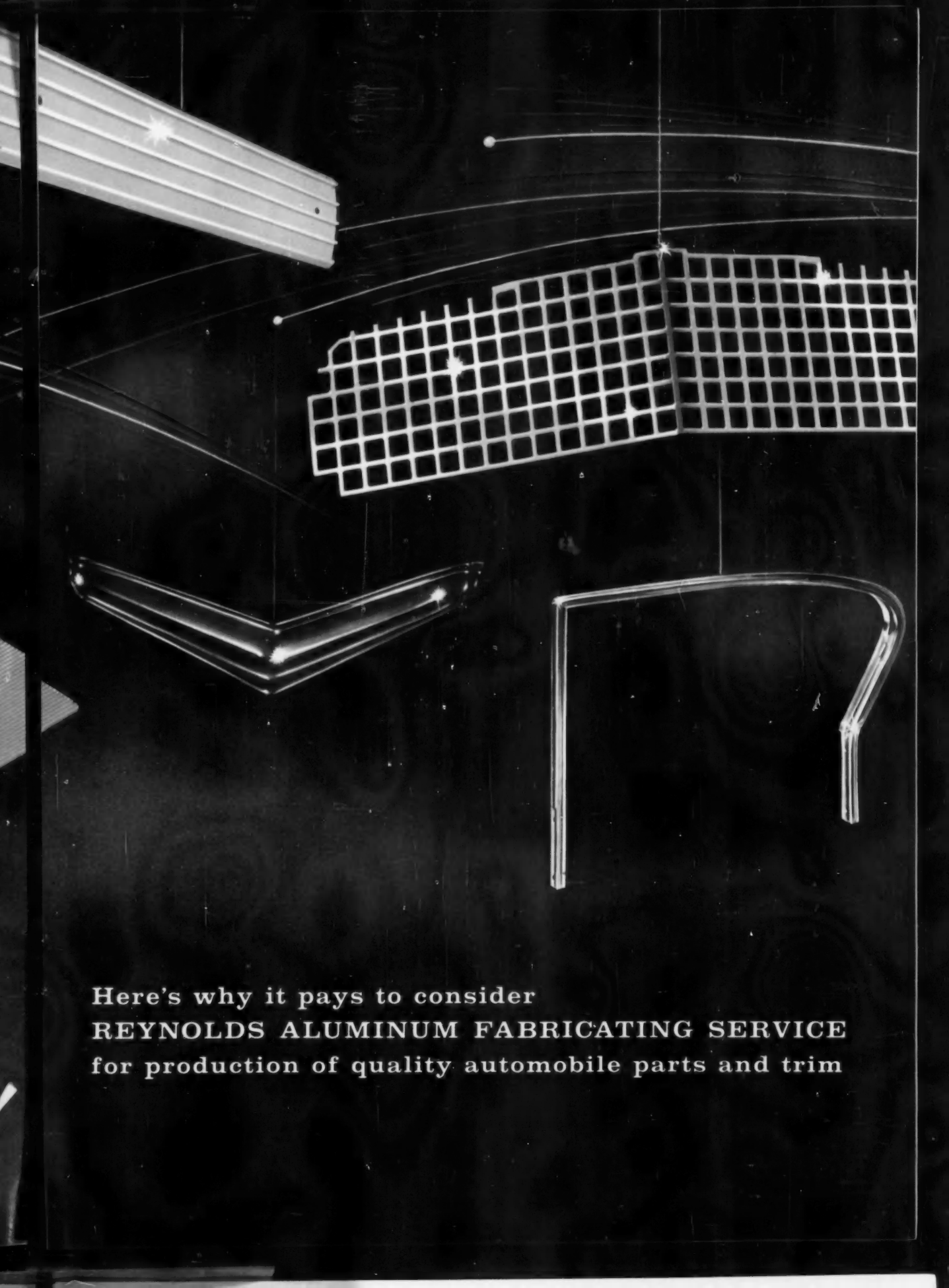
SERVICE



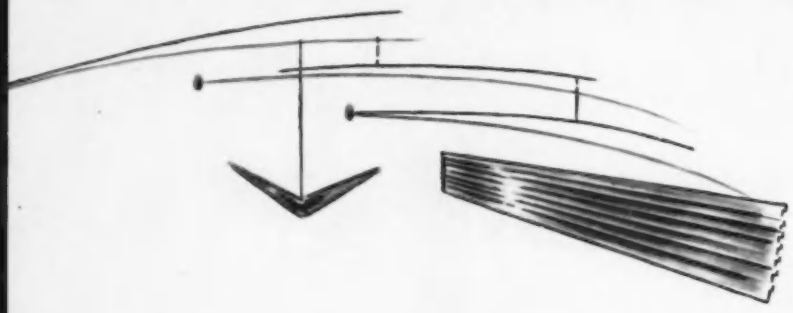
...these are typical color anodized
trim parts, fabricated and finished by

REYNOLDS ALUMINUM FABRICATING SERVICE





Here's why it pays to consider
REYNOLDS ALUMINUM FABRICATING SERVICE
for production of quality automobile parts and trim



Vast fabricating facilities, experienced design and engineering assistance and quality control from mine to finished product are

3 GOOD REASONS WHY...

it pays to rely on Reynolds Aluminum Fabricating Service for production of aluminum automobile parts and trim.

AND–

Reynolds extensive finishing facilities have been expanded by the installation of today's latest automatic finishing equipment. This tremendous investment by Reynolds offers you finishing facilities unsurpassed anywhere. Assures you finer finishes on the aluminum parts you design. Gives you new flexibility in your design thinking. Reynolds years of technical experience with practically every finishing process and technique applicable to aluminum go hand in hand with these expanded facilities.

For *color anodized* finishes in new gold or blue or other gleaming colors—in-the-metal finishes that will never pit or chip or flake or tarnish . . . for *clear anodized* finishes with the mellow luster and the "look of sterling"...for all types of *electrolytic, chemical, mechanical* and *paint film* finishes . . . for the highest quality from "start to *any finish*", let Reynolds fabricate and finish your aluminum parts.

For full details on Reynolds fabricating and finishing facilities, contact your nearest Reynolds Branch Office or write *Reynolds Aluminum Fabricating Service, 2002 South Ninth Street, Louisville 1, Kentucky.*

REYNOLDS ALUMINUM FABRICATING SERVICE

BLANKING • EMBOSSING • STAMPING • DRAWING
RIVETING • FORMING • ROLL SHAPING
TUBE BENDING • WELDING • BRAZING • FINISHING

SHORTIES

Rubber used in the landing gear system of a modern jet bomber is sufficient to manufacture 100 automobile tires.

•

America's steel wire industry in 1955 rolled out 5.533 million tons of products to the nation's manufacturers and stores.

•

It takes seven million tons of finished steel a year to keep the farmer supplied with tractors and trucks, farm and household equipment and automobiles. Farmers also require 300 million lb of raw rubber, more than 17 billion gal of crude petroleum, and 22 billion kilowatt hours of electricity to keep their equipment operating.

•

The number of vehicles equipped with 12-volt electrical systems on the highways just six years from now will probably equal the total registration of vehicles in 1950.

•

Experts figure that two out of three of the nation's 3.360 million miles of streets and highways are wholly inadequate for today's modern vehicles. They go on to state that about 1.7 million miles of this network of roads and highways are probably unsafe for drivers.

•

Six out of every 10 American families own automobiles, and they spend an average of $325 a year to operate them. Roughly 60 per cent, or $200, is spent on service station items. The lion's share of each dollar, 43.2¢, goes for gasoline. Motor oil represents 4.2¢; new tires, 5.3¢; and batteries, 2.1¢.

•

Fifty-five per cent of car trips are made by family earners in getting to their jobs or business. Another 13 per cent of car trips are made for shopping purposes.

Measure glove cost by PERFORMANCE . . . not PRICE!

You'll find you SAVE with JOMACS

The difference between *first costs* and *replacement costs* is the difference between ordinary work gloves and Jomac Gloves. While bargain buys are wearing out and being replaced, sturdy Jomacs are being used, cleaned or reconditioned, and re-used again and again. Jomac quality means better service, longer life, lower *net* costs.

FACTS ABOUT JOMACS

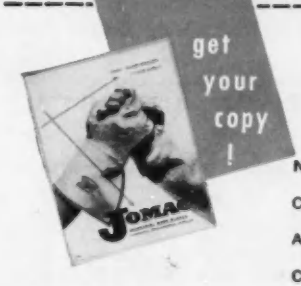
- Made from the famous loop-pile fabric identified with the Jomac name for 17 years
- Rugged protection for hands against hot, sharp, or abrasive objects—yet flexible for comfort and full finger freedom
- Many styles interchangeable—fit either hand—so each pair has four long-wearing surfaces
- Can be cleaned or reconditioned many times over
- Available in most styles with knit wrist, safety cuff, or gauntlet (illustrated)

JOMAC

INDUSTRIAL GLOVES

PROOF that quality *means* economy

• SEND COUPON FOR NEW JOMAC GLOVE CATALOG



JOMAC INC.

Philadelphia 38, Pa., Dept. H.

☐ Yes! Send me your new Jomac Industrial Work Gloves Catalog.

Name_____

Company_____

Address_____

City_____ State_____

ON OUR WASHINGTON WIRE

Atomic Energy Commission hopes to get $282.6 million for new plant and equipment buying during the coming fiscal year. Administration calls upon Congress to appropiate $144.2 million in new funds to $138.4 million from funds voted earlier.

OUT OF THESE SKILLS GROW

dependable motors for your product . . .

Out of long experience in the small motor field — in research, engineering and manufacturing — come the dependability and exceptional performance of Lamb Electric Motors.

Our plant is equipped and organized to *custom manufacture* on a volume basis, and our costs are proportional to the quality level your product requires.

Teaming up your engineering department with ours will enable *your* company to profit from these advantages.

THE LAMB ELECTRIC COMPANY • KENT, OHIO

In Canada: Lamb Electric—Division of Sangamo Company Ltd.—Leaside, Ontario

Lamb Electric SPECIAL APPLICATION FRACTIONAL HORSEPOWER **MOTORS**

Military spenders will start the new fiscal year on July 1 with purses well-filled with public money. They will have, by official count, $74.6 billion in new and carryover funds to cover all costs.

State investment in roadbuilding is showing a steady gain. Bureau of Public Roads reveals that, for the 12 months ended in March, authorities placed $2.8 billion in construction contracts for a 17 per cent increase above the total for contracts awarded in the previous 12-month period.

In the 12 months beginning July 1, Defense Dept. intends to contract for nearly $1.8 billion worth of guided missiles. This compares with $938 million in the current fiscal year.

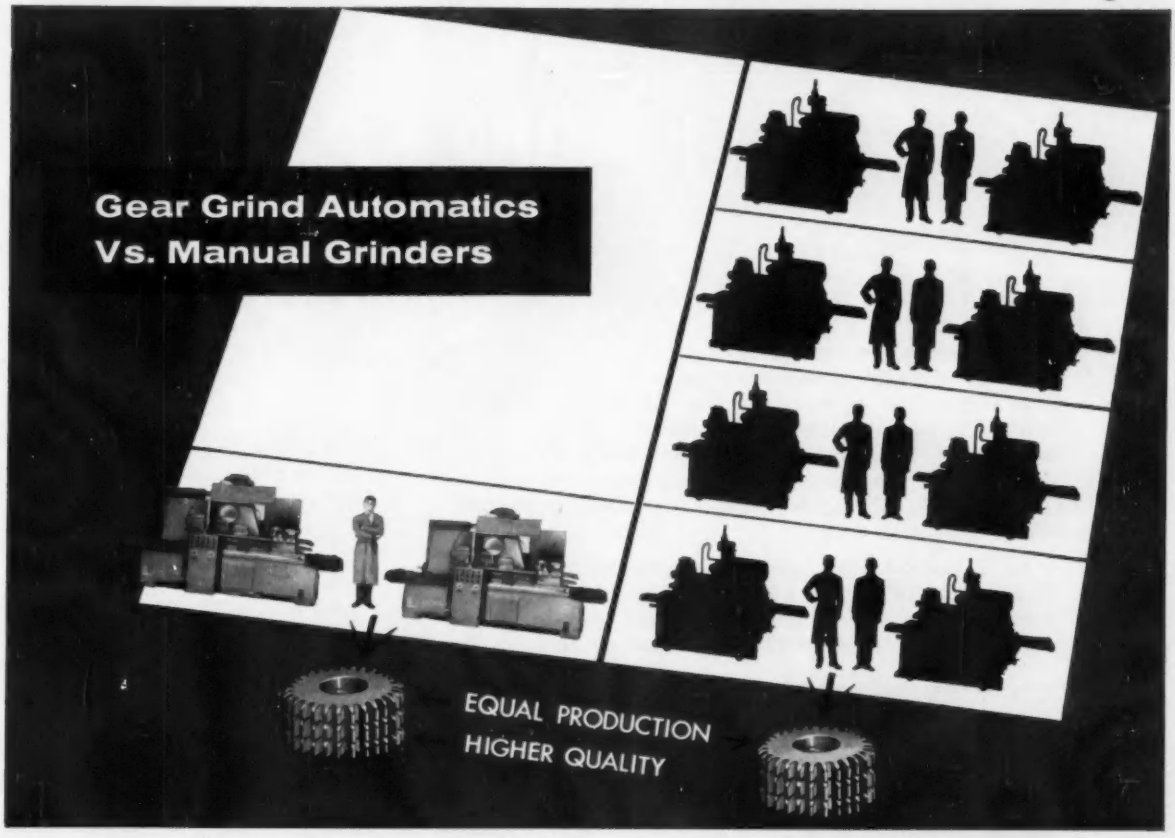
Conflicting lower court decisions on whether Government antitrust charges are cancelled out if the defendant corporations are dissolved or merge with a non-defendant are still standing. U. S. Supreme Court has refused to rule on the problem.

New car buyers will be asked to help Government appraise the health of consumer credit by telling how they financed their purchases. A cross-section of those who bought automobiles in 1954 and 1955 will be asked about their financial positions and financing arrangements, jobs, and family status.

Top professional experts who are willing to work for the armed services are woefully scarce. Defense Dept. is ordering a new study to find if better salaries will attract superior men to the waiting key jobs.

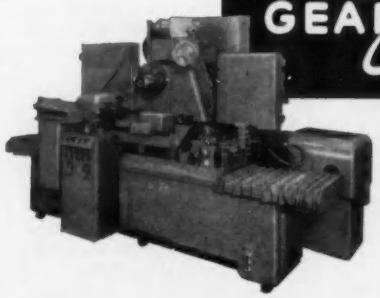
Government is operating 19,771 commercial activities, according to a Budget Bureau report. It showed that $11,863,990,569 in capital assets are engaged in turning out goods and services.

Here's real grinding economy!



2 Automatics with 1 Operator Equals 8 Manuals with 8 Skilled Operators

¼ the floor space
¼ the number of machines
⅛ the manpower
} Gear Grinding Economy



GEARGRIND Detroit

PUMP ROTORS
580 pcs./8 hrs./machine

PUMP GEAR

floor to floor grinding cycle—6 minutes

For all the facts—write today!

THE GEAR GRINDING MACHINE COMPANY

3903 Christopher, Detroit 11, Michigan

Manufacturers of:

The Detroit Screwmatic 750, Automatic Screw Machine.
RZEPPA ("Sheppa") Constant Velocity Universal Joints

Lepel
HIGH FREQUENCY *Induction* HEATING UNITS

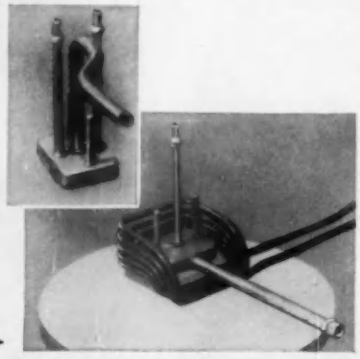
BRAZING
HARDENING
BOMBARDING
SOLDERING
ANNEALING
MELTING

The Lepel line of induction heating units represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating. With a background of half a century of electrical and metallurgical experience, the name Lepel has become the symbol for quality in induction heating equipment embodying the highest standards of engineering achievement, dependable low cost operation and safety.

If you are interested in the application of induction heating you are invited to send samples of the work with specifications of the operations to be performed. Our engineers will process these samples and return the completed job with full data and recommendations without any cost or obligation.

TYPICAL INDUCTION HEATING APPLICATIONS

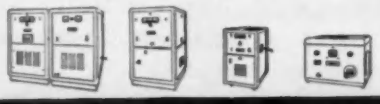
A Lepel installation at Federal Telephone and Radio Co. shown soldering transformer terminals. A precision operation made so simple that even unskilled operators can achieve excellent results on a production basis.



The simultaneous soldering of a group of components within one load coil is an ideal application for induction heating. The assemblies consist of mounting studs and tubes inserted into a machined part together with preformed solder rings. The heating is done so rapidly that there is practically no scaling or discoloration.

Electronic Tube Generators—1 KW; 2½KW; 5 KW; 10 KW; 20 KW; 30 KW; 50 KW; 75 KW; 100 KW.
Spark Gap Converters 2 KW; 4 KW; 7½ KW; 15 KW; 30 KW.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information.



All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

AI TABLOID

(Continued from page 37)

Ethyl Corp. has taken options on land near Joliet, Ill., as a possible site for a new plant.

* * *

Industrialist Howard Hughes is seeking Civil Aeronautics Board permission to make jet airliners.

* * *

Kaiser Aluminum & Chemical Corp. has organized a new section in its Product Development Dept. to coordinate styling as an integral part of the development of new and broader aluminum applications.

* * *

North American Aviation has received a multi-million dollar Air Force order for F-100F Super Sabre jets.

* * *

Bristol Aero-Engines, Ltd., is negotiating the sale of a civil version of the Olympus turbojet engine with aircraft manufacturers and airline operators. It is under consideration by Boeing.

* * *

Pennsylvania Salt Manufacturing Co. has announced further expansion of its operations in Mexico.

* * *

Wettlaufer Engineering Corp. of Detroit has acquired a second plant at 19800 West Eight Mile Road.

* * *

Trimedge, Inc., has been reorganized under the name of Empire Aluminum Co. . . . American Phenolic Corp. has changed its name to Amphenol Electronics Corp.

* * *

Electric Storage Battery Co. has formed a new Alkaline Div. in the Engineering Dept. of its Exide Industrial Div.

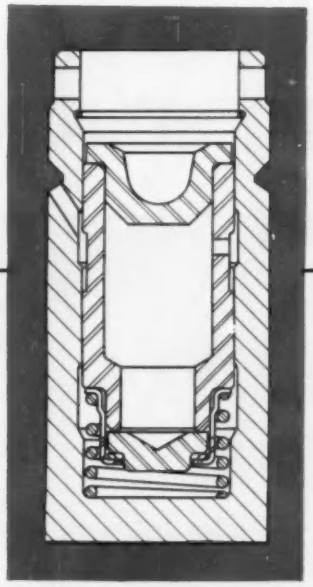
* * *

General Electric Co. will build a plant near St. Petersburg, Fla., to manufacture electronic equipment. . . . Firestone Tire & Rubber Co. has announced plans for the construction of a $5.3 million tire and tube manufacturing plant in the Philippines and the development of a rubber plantation there.

(Turn to page 164, please)

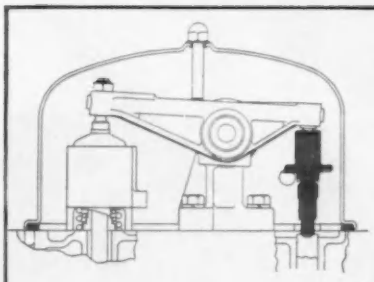
Designing valve gear?

We invite you to use these specialized CHICAGO services

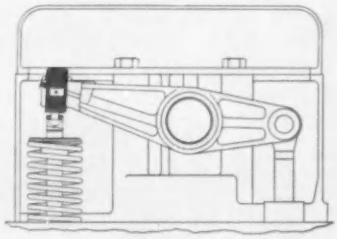


CHICAGO SPRING-LOADED FLAT VALVE HYDRAULIC TAPPET

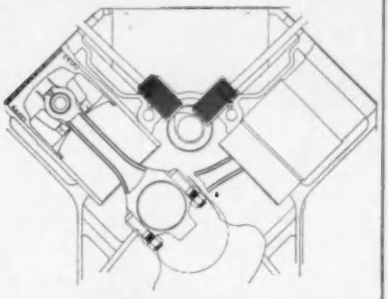
INSERT TYPE ROCKER ARM UNIT



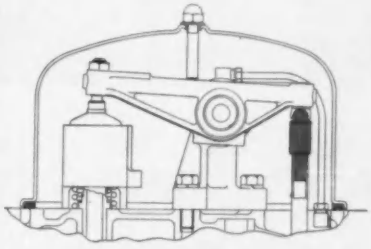
PUSH ROD TYPE FOR COMPRESSION RELEASE APPLICATION



THREADED TYPE ROCKER ARM UNIT



V-8 AUTOMOTIVE HYDRAULIC TAPPET APPLICATION



HYDRAULIC UNIT ON END OF PUSH ROD

Design

of complete valve gear installations for any type of engine . . . passenger car, truck, tractor, diesel, aircraft or industrial.

Development engineering

based on years of specialized experience in valve gear problems. The skills of our engineers will prove a valuable addition to your own engineering staff.

Tappet manufacturing

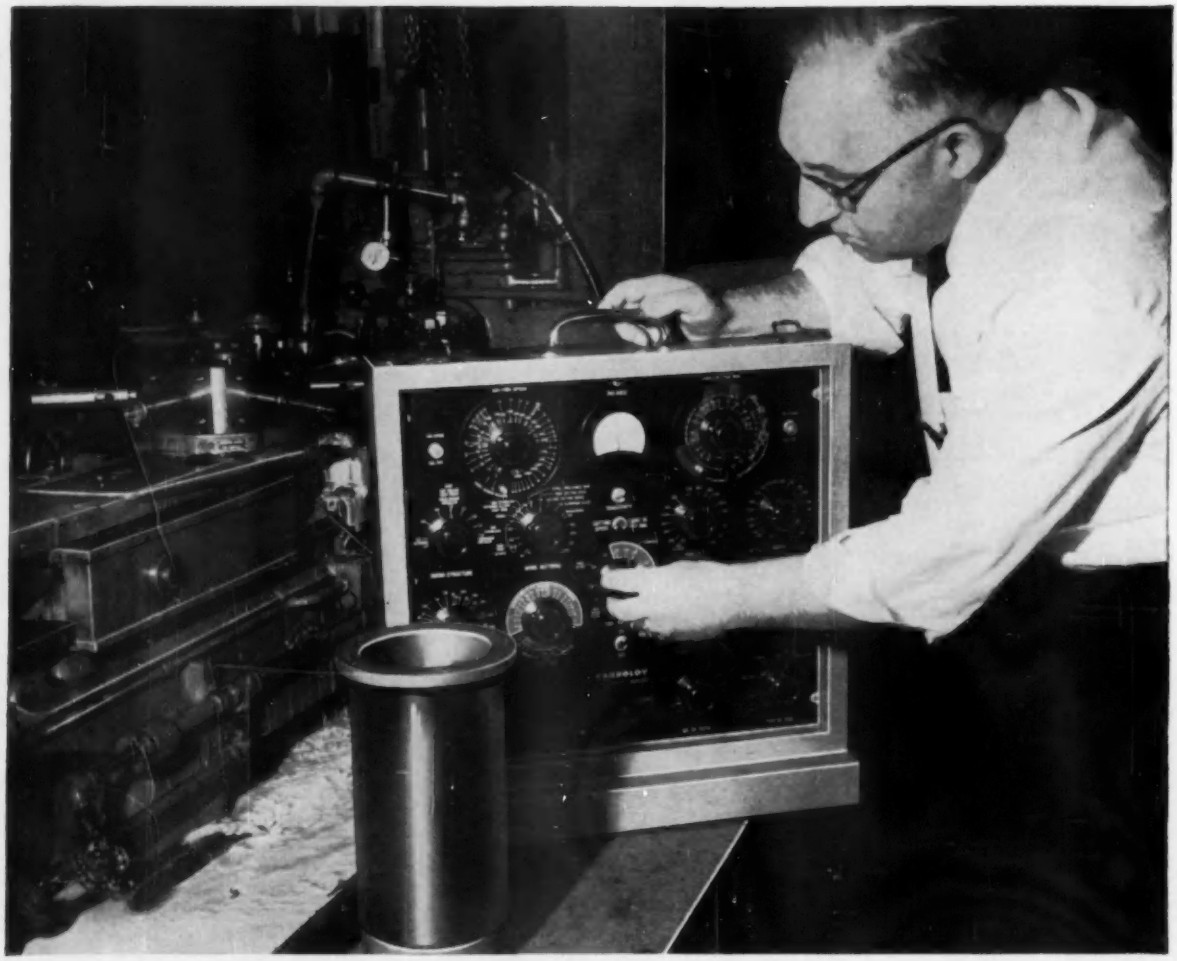
CHICAGO's facilities insure precision-manufacturing, scientific testing and rugged, trouble-free performance in every tappet. We will welcome the opportunity to serve you.

CHICAGO

THE CHICAGO SCREW COMPANY
Division of Standard Screw Company
2901 Washington Blvd., Bellwood, Ill.
Established 1872

At Scully-Jones and Co., Chicago:

MACHINING COSTS GREATLY REDUCED



Here's how the Carboloy Machinability Computer showed Scully-Jones and Co., Chicago, how to reduce machining time 46% on a single job. Original operating standard for machining expanding shells called for 244 minutes per part. But by calculating the optimum combination of speeds, feeds, and other data on the Computer, the company saved 48.8 minutes per part. The Computer was used to determine setups for both HSS and carbide tools . . . on turning, facing, drilling, and boring operations.

Partial list of plants now using the Carboloy Machinability Computer:

Allied Products Corp.
Armstrong Cork Company
Beech Aircraft Corp.
Bendix Aviation Corporation
Utica Division
Bethlehem Steel Company, Inc.
Boeing Airplane Company
Bryant Chucking Grinder Co.
Burroughs Corporation
Caterpillar Tractor Company
Chrysler Corp.
Airtemp Division
The Cincinnati Shaper Co.
Cone Automatic Machine Co., Inc.
DeLaval Steam Turbine Co.
The DoALL Co.
Fuller Company
General Electric Company
Gisholt Machine Company
Goulds Pumps Inc.
Greenfield Tap and Die Corporation
Geometric Tool Company Division
Greenlee Bros. & Co.
Houdaille Industries, Inc.
Buffalo Hydraulics Division
Joy Manufacturing Company
Claremont Division
Ladish Co.
The Maytag Company
Mergenthaler Linotype Company
Miehle Printing Press & Mfg. Co.
Mueller Brass Co.
The National Acme Company
The New Britain Machine Co.
New Britain-Gridley Machine Division
Pachmayr Corp.
Porter-Cable Machine Company
Reed Roller Bit Co.
Cleco Air Tools Division
The R. K. LeBlond Machine Tool Co.
Rockwell Spring & Axle Co.
Blood Brothers Machine Division
Ryan Aeronautical Company
S. Morgan Smith Co.
Standard Pressed Steel Co.
Sundstrand Aviation
A Division of Sundstrand Machine Tool Co.
Thompson Products, Inc.
Wagner Electric Corporation
Westfield Metal Products Co., Inc.
The Yale & Towne Manufacturing Co.
Yale Materials Handling Division

WITH CARBOLOY MACHINABILITY COMPUTER

- **Determined most efficient cutting conditions**
- **Set up new operating standards in seconds**
- **Eliminated wasteful tryout runs, saved stock**
- **Saved 17 hours' machining time on a single job**
- **Provided closer control over machine downtime**

Obtaining maximum production from their machines is now an easier matter for Scully-Jones and Co., Chicago. Machining data are fed into their Carboloy® Machinability Computer . . . and in seconds, optimum speeds, feeds, horsepower ratings, or any of 16 other operating variables are figured for the operator.

On the job at left, for example, the Computer showed how to cut machining time 46% on a 13-piece run . . . saving 17 machining hours, and eliminating wasteful, time-consuming tryout runs.

Benefits extend plant-wide

On other jobs throughout the plant, the Computer established new operating standards, corrected and verified existing ones. When necessary to improve tool life or production rate, the Computer determined new operating conditions in a fraction of the time previously required.

The advantages of the Carboloy Machinability Computer extend far beyond figuring job setups. The Computer simplified inventory problems by predicting the rate of tool wear. It aided grinding rooms in planning work loads, and helped the plant superintendent coordinate production schedules.

The Carboloy Machinability Computer can be used by anyone with machining experience, after a short familiarization period. And, it can be a powerful educational tool by teaching operators how to improve production or reduce downtime through proper variations in operating conditions.

Ask for demonstration

The Machinability Computer is battery-operated, portable, and rugged. It is priced at $495 (f.o.b. factory, Detroit).

For more information on how the Computer can help your plant increase production and reduce manpower costs, mail the coupon below. If you wish, we will gladly arrange a demonstration in your plant.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11151 E. 8 Mile Ave., Detroit 32, Michigan

☐ Please send more information on the Carboloy Machinability Computer.

☐ Have a representative make an appointment to demonstrate the Computer.

NAME_____
TITLE_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

AI TABLOID

(*Continued from page* 160)

Vickers, Inc., has completed an extensive program of reorganization within its Engineering Dept.

Le Roi Div. of Westinghouse Air Brake Co. has launched a $5.5 million engineering and research expansion program at its Milwaukee plant. . . . Kaiser Steel Corp. is undertaking a $113 million expansion of its Fontana, Calif., steel mill.

* * *

Fairchild Engine & Airplane Corp. has disclosed that its new F-27 twin project passenger transport plane will be manufactured at an initial rate of five aircraft each month and then 10 per month.

Glenn L. Martin Co. has been chosen by the Air Force to develop a new experimental tactical bomber. . . . Northrop Aircraft, Inc., has been awarded an Air Force contract for a new supersonic jet trainer.

* * *

Joseph T. Ryerson & Son, Inc., has renamed its division of industrial engineering the Plant Engineering Div., while its division of standards and methods is now the Operating Controls Div.

* * *

Ansul Chemical Co. has developed a new pint-size fire truck for fighting fires inside industrial plants.

* * *

Air Reduction Co., Inc., has moved its executive offices to 150 East 42nd St., New York 17. . . . Association of National Advertisers, Inc., has moved to new offices at 155 E. 44th St., New York 17, N. Y.

* * *

Lincoln Engineering Co. has merged with McNeil Machine & Engineering Co.

* * *

Blue Bird Body Co. and Coach and Equipment Sales Corp. have jointly launched a new school bus manufacturing company at Penn Yan, N. Y. . . . William Christensen Co. is name of a new product development advertising engineering concern located at 14321 W. McNichols, Detroit 35, Mich.

* * *

Sylvania Electric Products, Inc., has announced a multi-million dollar expansion program in the atomic power field.

* * *

Firestone Tire & Rubber Co. will build a 75,000-ton-capacity plant for the manufacture of styrene near Orange, Tex. . . . Vanadium Corp. of America will build near New Alexandria, O., a new plant for the production of ferro alloys.

* * *

Republic Aviation Corp. has created a research staff to deal with all aspects of jet and rocket combat aircraft and missiles.

* * *

Some experts predict that within 10 years, almost all helicopters produced in the U. S. will be powered by gas turbine engines.

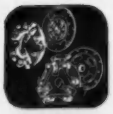
* * *

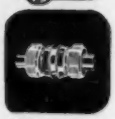
First automobile assembled in Pakistan recently rolled out from the General Motors Assembly Plant in Karachi.

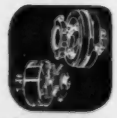
(*Turn to page* 166, *please*)

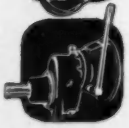
ROCKFORD

MEMO
Clutch must be conservatively rated—

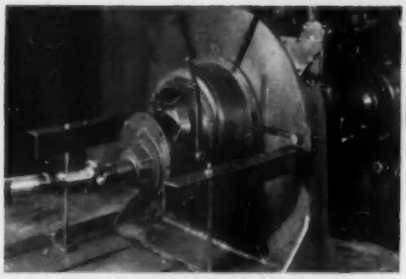




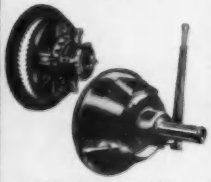




ROCKFORD POWER TAKE-OFFS are designed for generous overload capacity within the fields of service recommended by Rockford Clutch engineers.



POWER

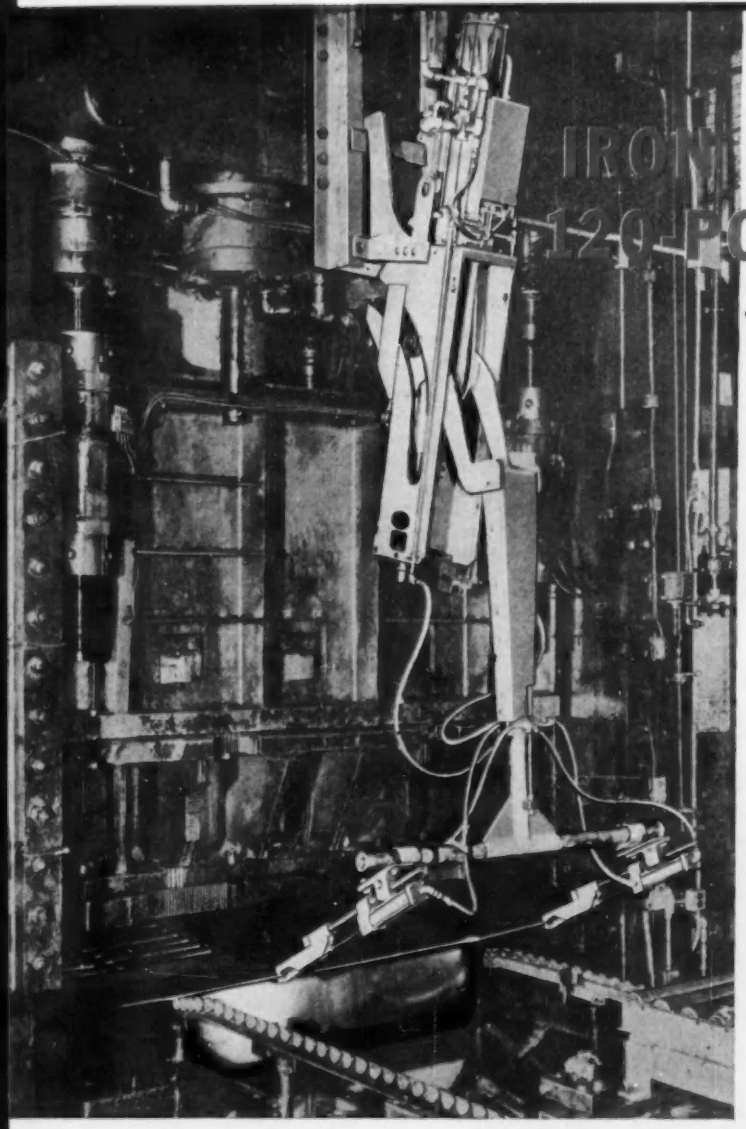


TAKE OFF

Large ROCKFORD clutches, power take-offs and speed reducers are tested for torque, engaging pressure, release, temperature, gear strength, bearing endurance and clutch facing wear on this 400 H. P. diesel powered, electric dynamometer. Let ROCKFORD engineers utilize this machine to improve your heavy-duty power transmission controls.

ROCKFORD
Clutch Division
BORG-WARNER
315 Catherine St., Rockford, Ill.

CLUTCHES



IRON HAND UNLOADS 120-POUND BATHTUBS

...at Kaiser Metal Products

As fast as this 1800-ton press can deep draw these 120-pound bathtubs, the Iron Hand moves in, raises the tub, and swings it out onto a conveyor.

As a result of this installation at the Bristol (Pa.) plant, Kaiser Metal Products, Inc., was able to—

speed up production by utilizing full-rated press capacity

increase safety by transferring two men to another line

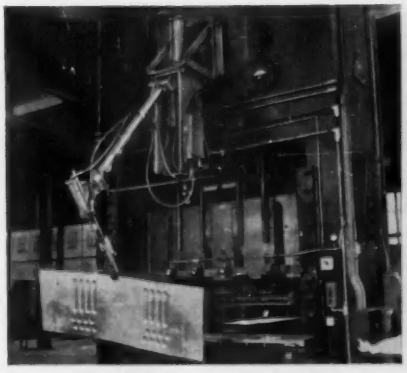
cut costs through greater output and lower labor charges.

Many other companies are finding the Iron Hand a low-cost, efficient production tool for virtually every type of sheet metal unloading. And here's why:

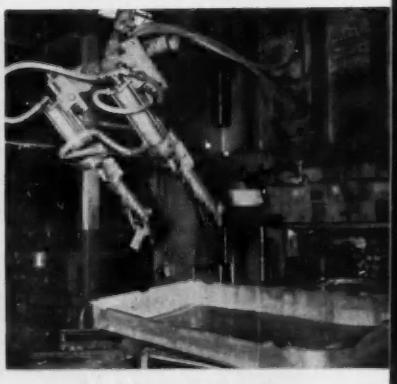
It's designed for fast installation, quick adjustments, and easy movement from press to press. With a wide selection of jaws available, the Hand can be adapted to a variety of stamped shapes.

Consider this: In every case a Sahlin Iron Hand brings you greater savings through higher output, increased safety, lower labor charges. You owe it to yourself to find out more about the Iron Hand. Write today for our new catalog.

BATHTUB BLANKS, of 14-gage steel, are fed to this 1800-ton double action press and are drawn to 15". Tubs weigh from 115 to 120 pounds, and are more than six feet long overall. Production rate: four to five a minute. Actually, Iron Hands can work at speeds up to 30 strokes per minute on medium size and large stampings. Because of the unusual nature of the blank, this model Iron Hand was specially-designed with double mounted jaw assemblies. Standard Iron Hands, equipped with single jaws, are ordinarily used to unload hoods, roofs, quarter panels and similar large stampings.



AT HOTPOINT—One of the many Iron Hands in use here, this one is shown unloading an eight-pound oven liner. Iron Hands unload practically any stamping.



ON REFRIGERATOR DOORS—A special Iron Hand is used to whip doors out of the die as fast as the press can make them.

SAHLIN IRON HAND

SAHLIN ENGINEERING COMPANY, INC.

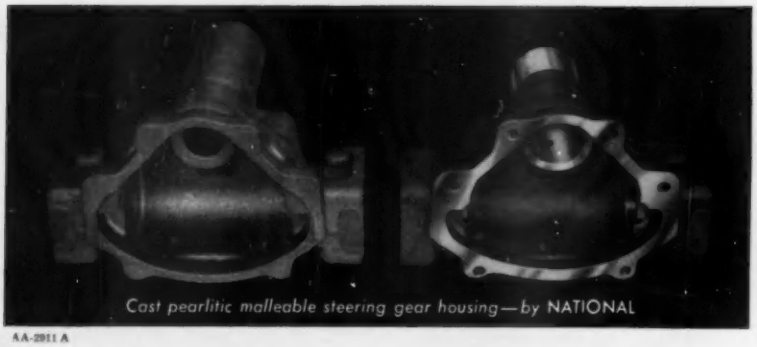
P. O. Box 289, Birmingham, Michigan

OVERHEAD ARMS • FLOOR TYPE UNLOADERS • TURNOVER, TRANSFER AND LOADING MACHINERY

The rougher the service,

the greater the need for

PEARLITIC MALLEABLE CASTINGS



Cast pearlitic malleable steering gear housing—by NATIONAL

AA-2911 A

In mines and quarries . . . on the big construction jobs—that's where trucks take the worst beating. And that's also why many off-highway truck manufacturers have turned to pearlitic malleable castings—by National—for heavy duty parts. For truck builders know that pearlitic malleable has high ultimate strength . . . resists wear and fatigue under heavy loads and impacts.

And there are lots of other "plus" advantages in pearlitic malleable castings—from National. For example, they possess excellent non-seizing properties . . . can be either liquid or air-quenched . . . can be given a smooth finish. Perhaps *most important of all, pearlitic malleable machinability index ranges from 80 to 90* (B1112 steel=100).

Pearlitic malleable castings—from National—can often reduce manufacturing costs, weight and assembly time . . . can increase quality and sales potential of *your* product.

NATIONAL MALLEABLE and STEEL **CASTINGS COMPANY**

Cleveland 6, Ohio

The nation's largest independent producer of malleable and pearlitic malleable

AI TABLOID

(*Continued from page* 164)

Cleveland Cap Screw Co. has leased its Plant No. 2 to Euclid Div. of General Motors Corp. and moved its Hot-Heading Dept. to a new plant in southeast Cleveland. . . . Fairbanks, Morse & Co. has moved its Electronics Div. from Davenport, Ia., to East Moline, Ill.

* * *

Douglas F4D Skyray jet has gone into service with the U. S. Fleet.

* * *

Esso Standard Oil Co. is introducing a third grade of high-octane gasoline.

* * *

Chesapeake & Ohio Railway Co. has developed a new combination box car and highway truck trailer known as the Railvan.

* * *

Greif-Associates, Inc., is name of new engineering and industrial publicity firm at 570 Fifth Ave., New York 19, N. Y.

* * *

Temco Aircraft Corp. will manufacture complete wings for the new F-104A ultrasonic day-and-night fighter. . . . Goodyear Aircraft Corp. has been awarded a large contract to produce its new missile guidance systems for the Air Force.

* * *

General Electric Co. recently dedicated its new circuit breaker plant in Puerto Rico.

* * *

Fischer & Porter Co. has formed an Instrument Div. . . . Induction Motors Corp. plans to establish a company in France.

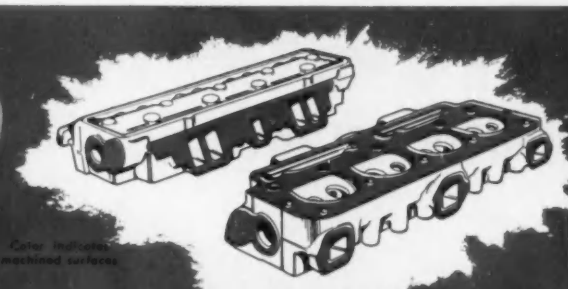
* * *

Pratt & Whitney Aircraft of Canada will build a $5 million addition to its Ville Jacques Cartier plant. . . . Yale Rubber Manufacturing Co. is building a 30,000 sq ft addition to the Sandusky, Mich., plant.

* * *

Hiller Helicopters has designed for the Air Force a retractible ramjet-powered rotor system for vertical take-off and landing of conventional fixed-wing airplanes.

CUSTOMER SPECIFIED



Color indicates machined surfaces

A leading automobile company requested Kearney & Trecker's Special Machinery Division to design and build an automatic transfer machine to perform a series of milling and drilling operations on V-8 cylinder heads.

KEARNEY & TRECKER MILWAUKEE® DESIGNED

Kearney & Trecker built this 12-Station Automatic Transfer machine which rough and finish mills the head gasket surfaces, mills intake and exhaust port surfaces and both ends, and drills, counterdrills and reams two holes on each of two cylinder heads for V-8 engines. Machine's production rate is 100 pieces per hour.

The two cylinder heads progress automatically through the machine side by side, each on separate transfer rails. Transferring, locating, clamping, lubrication and chip disposal are all automatic.

For more information on machine illustrated, ask for Data Sheet No. 1080. A new bulletin, SMD-56, which describes many of our outstanding designs, is also yours for the asking.

Production efficiency starts with

Kearney & Trecker Milwaukee machine tools

This typical example reduced costs and meant higher production for the buyer. Kearney & Trecker's Special Machinery Division's 50 years' experience in machine design and manufacture can mean considerable savings to you.

Take advantage of our abilities. They can pay off in profits for you. See or write your Kearney & Trecker Special Machinery Division representative. He will be pleased to give you all the details on this production machine. Contact him today!

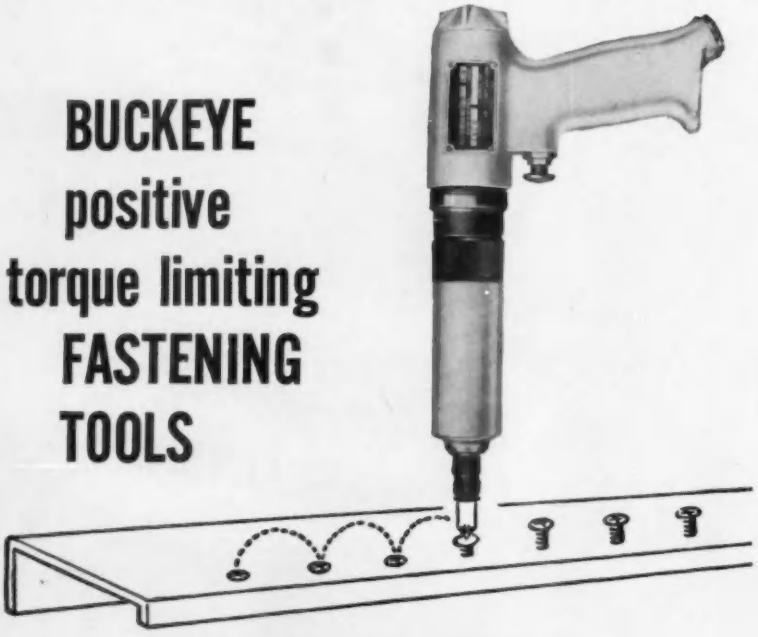
Special Machinery Division

MILWAUKEE 14, WISCONSIN, U.S.A.

Designers and Builders of Precision and Production Machine Tools Since 1898

a NEW way... to drive screws...to run nuts...

BUCKEYE positive torque limiting FASTENING TOOLS



Maintain Uniform Tightness

adjusts to any torque from 5 to 85 in./lbs.

Set the torque—just once—at any point between 5 and 85 in./lbs., and this Buckeye Torque Limiting Fastening Tool is ready to go! Apply the tool to the work—it sets itself for driving—AUTOMATICALLY . . . and it stays set even if you vary the pressure on the tool. The instant the screw or nut hits home, and that pre-set torque is reached, the tool clutch disengages—AUTOMATICALLY, even if the operator maintains pressure on the tool. Now, remove the tool from the work and it will re-set itself—AUTOMATICALLY.

Simple. Foolproof. Every fastener is just as tight as the one before. The workpiece doesn't get scratched or damaged. The fasteners won't strip or shear. And your bits and sockets will last longer, too.

If you aren't doing your fastening work this NEW way, with a Buckeye Torque Limiting Fastening Tool, better write —NOW—for complete information. Better still, why not ask for an in-plant demonstration—there's no obligation.

Buckeye Tools CORPORATION
DIVISION 21 • DAYTON 1, OHIO

producers of the world's first successful rotary air tools

MEN *in the* NEWS

(Continued from page 41)

Thompson Products, Inc., Accessories Div. — Leslie L. Aspelin is now engineering manager.

Emmett Machine and Manufacturing, Inc. —**Emile L. Dumas** has been elected president and general manager.

Permatex Co.—**Epes W. Sargent** has been appointed advertising manager.

Houdaille Industries, Inc.—**Robert L. Wilson** has been named vice-president for finance; **Thomas S. Bainbridge**, treasurer; and **Allan E. Lang**, assistant president.

Thor Power Tool Co.—**Jack R. DeBacher** has been elected a vice-president.

Lamson Mobilift Corp. — **John R. Titlow** is now a director and vice-president.

Webster Electric Co. — **David J. Munroe** has been named president.

H. M. Harper Co.—**H. M. Harper, Jr.**, has been appointed secretary.

H. K. Porter Co.—**Charles L. Holbert** has been appointed executive vice-president.

Ford Motor Co., Special Products Div.—**William H. Huber** was named sales promotion manager.

Firestone Tire & Rubber Co. — **Thomas G. MacGowan** has been appointed director of advance planning; **William D. Gohr**, manufacturer's sales manager; and **Robert D. Thomas**, manager of the Tire Sales Dept.

Bendix Aviation Corp., Computer Div.—**O. Paul Staderman** has been appointed director of marketing.

Harrison Radiator Div., General Motors Corp. — **John L. Nablo** has been made manager of the Buffalo plant.

Chrysler Corp.—**William G. Petty** was named purchasing agent for production materials, and **Cecil C. Chauvin** was chosen manager for research and analysis in the Central Purchasing Dept.

(Turn to page 170, please)

BCA

SINGLE ROW, DEEP GROOVE RADIAL BEARINGS

. . for superior performance in even the toughest applications

The ability of these BCA Conrad type ball bearings to sustain combined radial and thrust loads or thrust loads alone—in either direction—even at extreme high speeds, stems from design features like these . . .

- Largest size balls are used to give optimum ratio of ball diameter to bearing race section at the points of heaviest stress.
- Deep, uninterrupted ball raceways . . . precision-ground to conform closely to ball curvature.
- High shoulders on inner and outer raceways support balls laterally and permit bearing to carry thrust loads equal to 100% or more of the radial load rating.

You can count on BCA bearings for the kind of performance you are looking for . . . and on BCA for the flexibility you need to fill both your routine and emergency bearing needs.

ENGINEERS: Send for a copy of BCA's valuable 100-page "Engineering Handbook." Write on your company letterhead. It's free!

BCA

BEARINGS COMPANY OF AMERICA

DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC.

LANCASTER • PENNSYLVANIA

MEN *in the* NEWS

(*Continued from page* 168)

Abrasive Dressing Tool Co.—**John Booth** is now vice-president in charge of research.

Thermoid Co.—**Charles M. Scholz** has been elected vice-president.

Allen Electric and Equipment Co.—**Gerald L. Harmanson** is now advertising and sales promotion manager.

Kennedy Valve Mfg. Co.—**James R. Erven** has been named vice-president and sales manager.

Electro-Data Corp.—**Edwin S. McCollister** has been appointed vice-president in charge of marketing.

Shakeproof Div., Illinois Tool Works—**Charles W. Edmondson** has been named sales manager of the Eastern District.

Ohio Seamless Tube Div., Copperweld Steel Co.—**Glen J. Hartman** was appointed manager of operations.

Young Radiator Co.—A. D. Bogus was promoted to sales manager of the Industrial and Oil Field Div.

Consolidated Electrodynamics Corp.—**William F. Johnson** is now director of sales.

Square D Co.—**Sager T. Colman** was made export manager.

Continental Div., Ford Motor Co.—**Otto M. Nedved** has been named manager of the Marketing Dept., and **Michael A. Dorsch** succeeds him as manager of the Financial Analysis Dept.

B. F. Goodrich Industrial Products Co.—**Evart W. Wright** has been named manager of molded and extruded products.

Borg-Warner International Corp.—**Earl W. Haefner** is now assistant to the president.

Buhr Machine Tool Co.—**James E. Barnes** has been appointed sales manager.

Perfect Circle Corp.—**John A. Thomas** has been named manager of the piston ring foundry at Rushville, Ind.

Ford Motor Co. of Canada—**J. C. Miller** has been appointed director of advertising.

Caterpillar Tractor Co.—**Hans G. Frommer** has been named production manager of the Glasgow, Scotland, plant.

Producto Machine Co.—**Merton C. Grilley** has been appointed vice-president.

Pennsylvania Salt Manufacturing Co.—**Bruce W. Wilson** is now sales supervisor of steel and tin mill accounts.

Aerojet-General Corp.—**George Pelletier** has been appointed director of public relations.

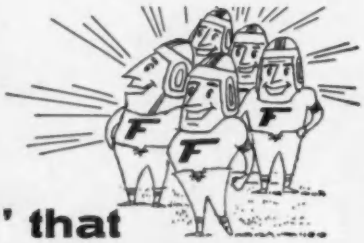
Packard-Clipper Div., Studebaker-Packard Corp.—**Erwin A. Weiss** has retired as executive engineer.

Motor Wheel Corp.—**Karl Egeler** was named director of advertising and sales promotion.

Superior Tube Co.—**William O. Nussear, Jr.,** has been appointed marketing manager.

(*Turn to page* 172, *please*)

FASCO



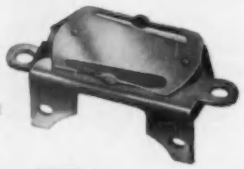
The "Extras" that became "Regulars"

On America's Leading Cars and Trucks

- AUTOMATIC RESET CIRCUIT BREAKERS
- DIRECTIONAL SIGNAL FLASHERS
- HYDRAULIC STOPLIGHT SWITCHES
- LOW-PRESSURE INDICATING SWITCH
- SERIES "400" PRESSURE SWITCHES
- HEADLAMP SWITCH

Time was, when FASCO automotive components such as these were considered only as "extras." But they served their purpose so well and contributed so much to over-all performance and customer satisfaction—that one by one, they have been adopted as standard equipment by America's leading manufacturers of cars and trucks . . . a fine tribute to FASCO engineering skill and product dependability.

In the future, as today, FASCO will be ready with "look-ahead" designs to meet the requirements of the automotive industry . . . proof again that it always pays to CONSULT FASCO FIRST!



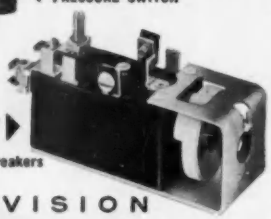
NEW! FASCO AUTOMATIC RESET MOTOR PROTECTOR

FASCO SERIES "400" PRESSURE SWITCH

NEW! FASCO LOW-PRESSURE OIL INDICATING SWITCH

FASCO HYDRAULIC STOPLIGHT SWITCH

NEW! FASCO HEADLAMP SWITCH with Integral Circuit Breakers



AUTOMOTIVE DIVISION

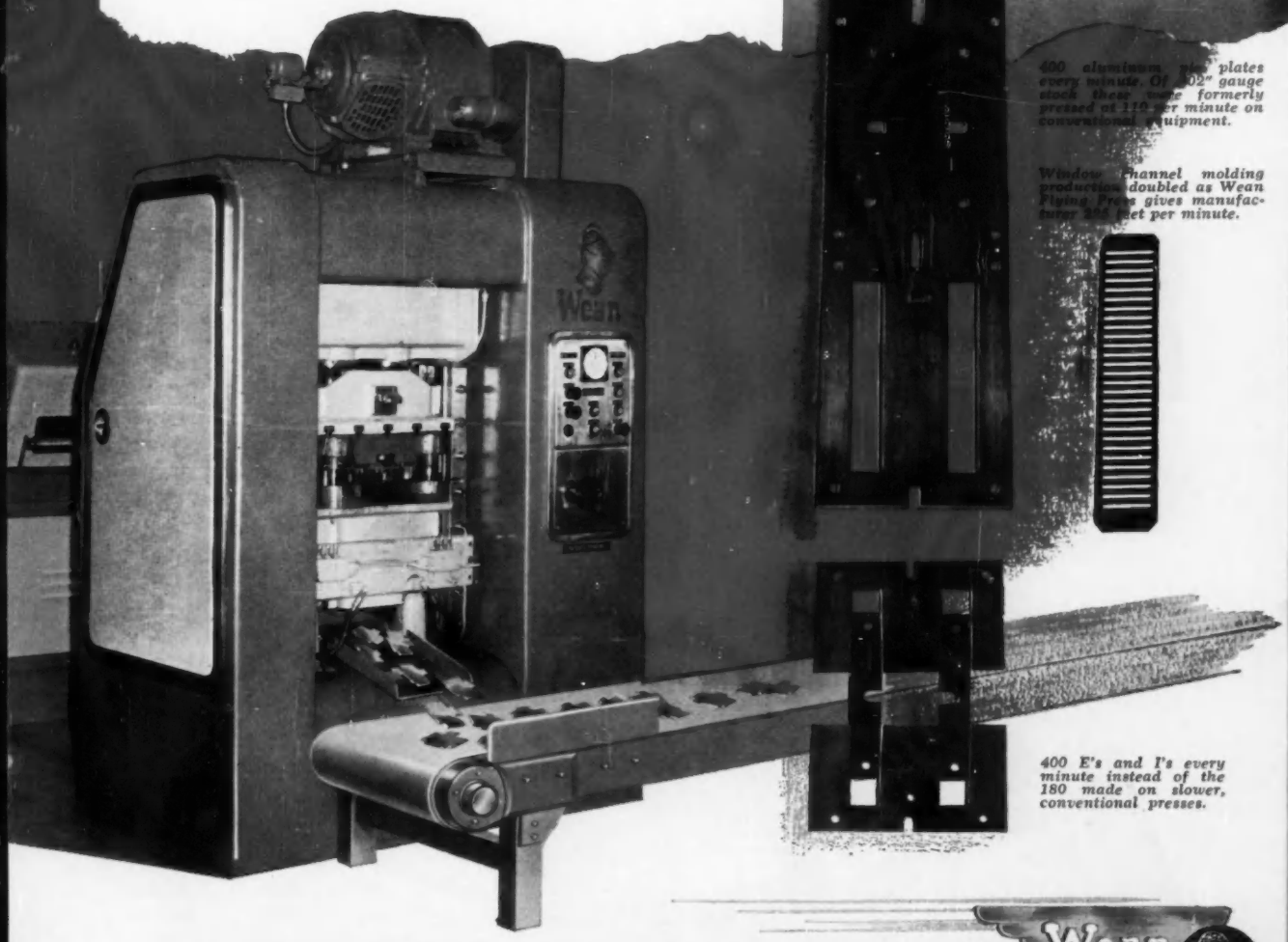
FASCO

INDUSTRIES, INC.

ROCHESTER 2, NEW YORK

DETROIT OFFICE—12737 PURITAN—PHONE: UN 17476

Performance Report on the Flying Press-



400 aluminum plates every minute. Of .032" gauge stock these were formerly pressed at 110 per minute on conventional equipment.

Window channel molding production doubled as Wean Flying Press gives manufacturer 355 feet per minute.

400 E's and I's every minute instead of the 180 made on slower, conventional presses.

Revolutionary Wean Press continues to amaze the industry

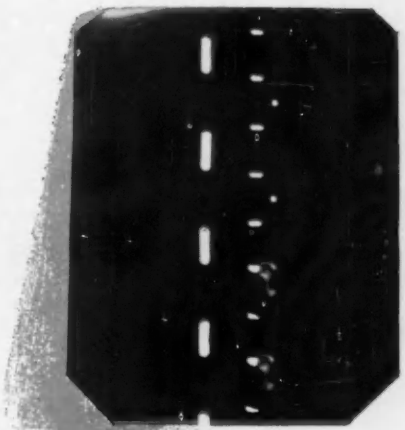
Wean FLYING PRESS

Since it was first introduced to industry, the Wean Flying Press has commanded the interest of imaginative production people.

On paper, it looked good. Tests on the hand made prototype were even more convincing. But, could a production model achieve such levels under actual operating conditions?

For the answer—note the typical production figures set down here. In every case, the Wean Flying Press, using standard die sets, has established a performance record.

Why not acquaint yourself with this amazing press now? Contact the Wean Sales-Engineer in your area or write direct.



Shallow draw and punch work on .065 gauge stock boosted to 400 pieces per minute by Wean Flying Press.

Wean

EQUIPMENT CORPORATION

CLEVELAND • CHICAGO • DETROIT • NEWARK, N. J.

Cable: WEANCOR

9935

F.O.S. INDUSTRIAL TAPE
REG. U. S. PAT. OFF.

NOW—
Industrial Tape
from Atomic
Research

Quality Controlled
by the Strontium 90
Isotopic Process

F.O.S. is processed to provide uniformity of product *and* performance, controlled by the unique Strontium 90 Process.

Denser, smoother, more consistent adhesive coating. Try it. Write on your letterhead for *free* F.O.S. samples.

Copyright 1955 The Seamless Rubber Co.

F.O.S. INDUSTRIAL TAPE DIVISION
THE SEAMLESS RUBBER COMPANY
NEW HAVEN 3, CONNECTICUT

SR SEAMLESS

MEN *in the* NEWS

(*Continued from page* 170)

Chrysler Corp. — *Harold C. Cook was named general purchasing agent.*

Girdler Co.—**W. Roberts Wood** has been elected president.

Cincinnati Milling Machine Co., Process Machinery Div.—**Robert W. Miller** has joined the organization.

Lear Electronic GmbH — **Hermann T. Poeschl** was named manager.

Carboloy Dept., General Electric Co.—**Benjamin E. Storrs** has been made carbide cutting tool specialist.

Denham & Co., Inc. — **Donald R. Acklin** has joined the organization.

Aero Supply Mfg. Co.—**William S. Eaton** has been named advertising manager.

International Business Machines Corp. — **Thomas J. Watson, Jr.,** has been elected chief executive officer.

Budd Co.—**Carl G. Schiez** has been named assistant comptroller.

E. F. Houghton & Co.—**Robert K. Smith** is now manager of research.

Firestone Tire & Rubber Co. — **Charles B. Ryan** was made general advertising and merchandising manager.

E. W. Bliss Co., Mackintosh-Hemphill Div.—**Marquis P. Orr** was named assistant manager of roll sales.

Park Chemical Co., Automotive Div. —**Larry M. Olson** has been made sales manager.

Union Steel Products Co., Materials Handling Div.—**Wallace Schermer** is now sales manager.

Acme Steel Co.—**John R. Davey** was named manager of the Metallurgical Dept.

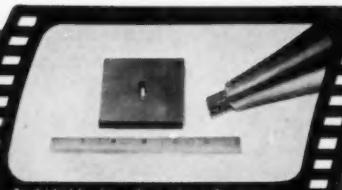
Warner Electric Brake & Clutch Co. —**Duane Branaka** has been made St. Louis district representative.

Bulldog Electric Products Co.— **Arthur G. Curtin** has been appointed midwest regional manager, succeeding **Merle P. Spurrell,** who has become general sales manager; **H. L. Barger** is now Philadelphia district manager.

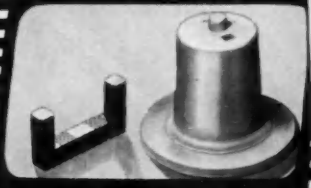
(*Turn to page* 176, *please*)

Nothing is too HARD to be Machined by

Sheffield's CAVITRON



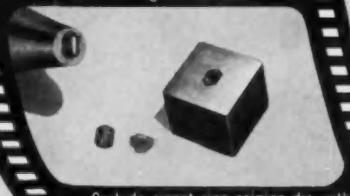
Carbide blanking die and the Cavitron tool used to sink it.



Ferrite yoke slotted after sintering and glazed porcelain in which three round and one square cavities were sunk.

H.SS. lockwasher die blank, die and the tool which produced it.

H.SS. blanking die and tool.



Carbide signet ring coining die with finished ring and Cavitron tool.

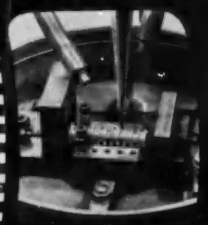
Cavitron is an ultrasonic tool by which even the hardest materials are machined readily, accurately and economically. And without regard for their electrical characteristics.

Because no heat is generated by the machining process no change is produced in physical properties of the material machined.

Cavitron is designed and built by the Sheffield Corporation which has been manufacturing precision tools for 50 years. In Cavitron you get the accuracy, rigidity and ease of control characteristic of the highest American Standards.

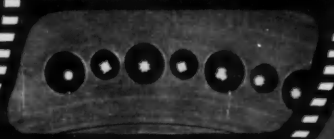
MACHINABLE MATERIALS	MACHINING OPERATIONS	PRODUCTS PRODUCED
Hardened tool steel	Drilling—boring	Dies, steel and carbide
Cemented carbides	Contouring—Engraving	Machine and motor elements
Ferrite—Germanium	Slicing and dicing	Electrical and electronic components
Cermets—ceramics—glass	Tapping	Jewell bearings—tools
Aluminum oxide		Tire molds—carbide inserts
Precious stones—quartz		

Group of parts machined by Cavitron.



Sinking diamond shaped ports in a servo valve sleeve.

Group of Cavitron machines in assembly.



Cavitron cuts holes of varying shape in a plastic extrusion die.

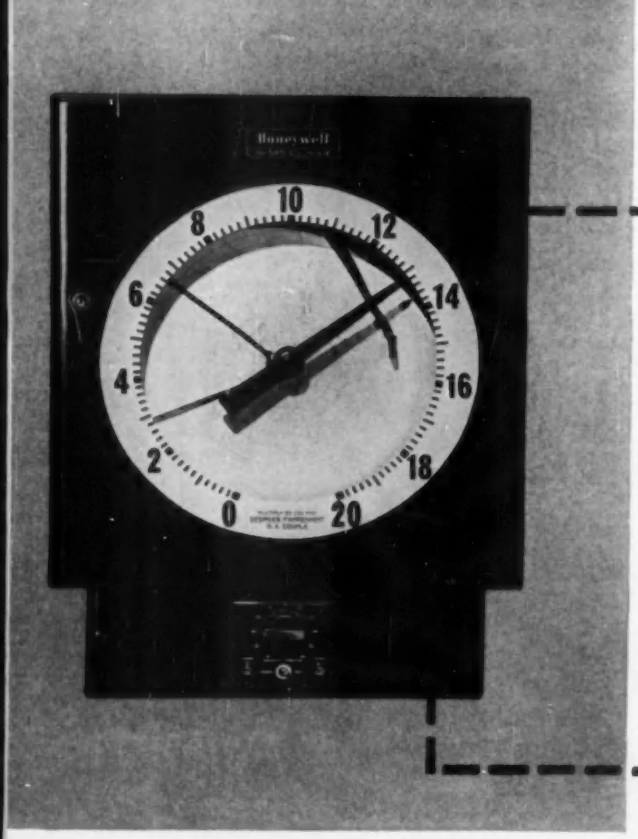
Have a Sheffield engineer show you in your own office the recent sound-slide film "Machining the Unmachinable." Here is Cavitron in operation. Write to Dept. 4—*THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A.*

7224

MASTER CRAFTSMAN GOLDEN ANNIVERSARY HEADQUARTERS

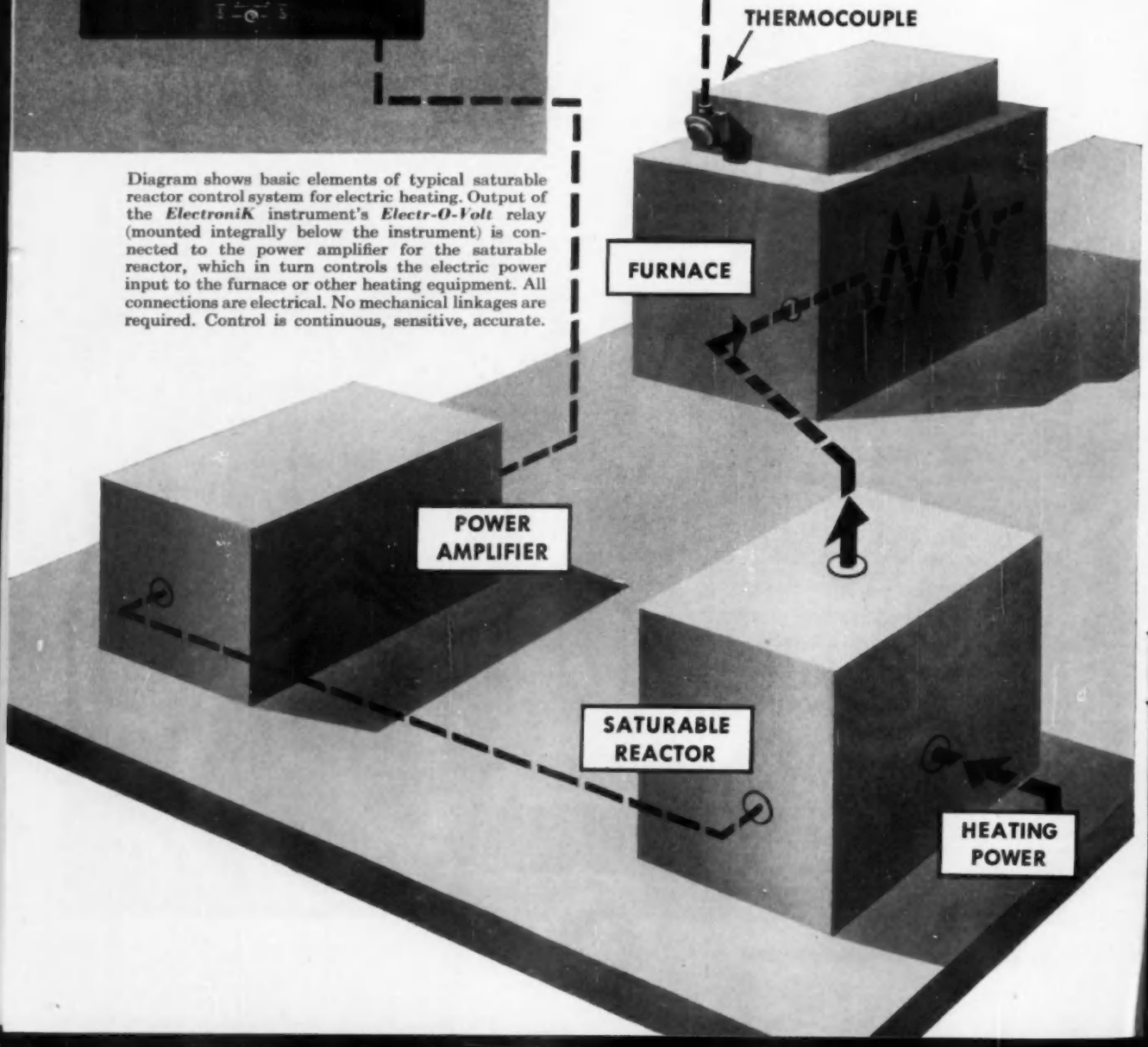
SHEFFIELD

manufacture and measurement for mankind



Now—

Diagram shows basic elements of typical saturable reactor control system for electric heating. Output of the *ElectroniK* instrument's *Electr-O-Volt* relay (mounted integrally below the instrument) is connected to the power amplifier for the saturable reactor, which in turn controls the electric power input to the furnace or other heating equipment. All connections are electrical. No mechanical linkages are required. Control is continuous, sensitive, accurate.



continuous, accurate control of electrically heated equipment

ElectroniK instrumentation with Electr-O-Volt* relay provides continuous throttling in saturable reactor control systems

You can now regulate temperatures of electrically heated furnaces, ovens, and similar processing equipment within exceptionally close tolerances, by using an advanced *ElectroniK* control system in conjunction with saturable reactors. This type of control eliminates the abrupt surges of power and the expense of contact replacement which are frequently objectionable factors of on-off or pulsed electric control.

Continuous control action. The *Electr-O-Volt* relay, actuated by the *ElectroniK* instrument, provides continuously variable control input to the saturable reactor power amplifier. This arrangement gives true proportional-plus-reset control action, which adjusts heat input to compensate for size of load, ambient temperature and other transient and long-term variations in heat demand.

Completely electronic. The system has no mechanical linkages, contactors, or other complex moving parts. Its high speed and sensitivity give the precise control required by modern processes.

Broad range of use. *ElectroniK* control for saturable reactors is applicable to high-temperature heat-treating furnaces, reaction vessels and many other types of electrically heated equipment. It makes possible smooth, finely-adjusted regulation of electric power at high efficiency.

For a discussion of how this control can be applied to your specific problems, call your local Honeywell sales engineer. He's as near as your phone.

Minneapolis-Honeywell Regulator Co., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario. *Trademark

● **REFERENCE DATA:** Write for Catalog 1531, "*ElectroniK* Controllers," and for new Specification S152-2—"*ElectroniK* Instruments with Electr-O-Vane Proportional Control."

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

new from **BESLY!**

BESLY METRO

CARBIDE TIPPED TOOLS

Designed and Quality-Made for HEAVY DUTY and FINISH cutting at LOW COST!

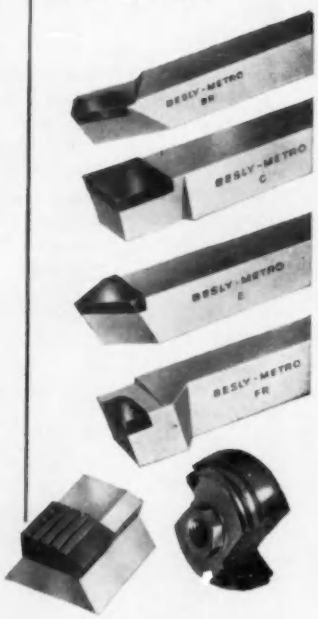
BESLY METRO — standard carbide tools because of workmanship and accuracy last longer.

BESLY METRO — special carbide tipped tools of close tolerances and special features — our specialty!

BESLY METRO — consistent uniformity gives good results tool after tool.

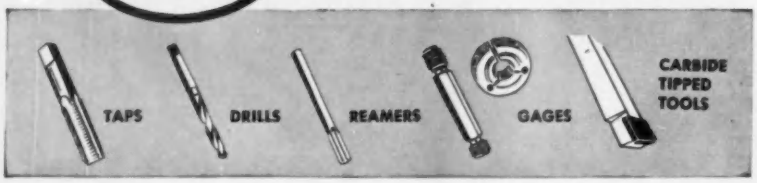
CALL your Besly Distributor for FAST DELIVERY
(overnight delivery on "Standards")
Write for our new catalog

STANDARDS and SPECIALS for a wide range of cutting jobs



BESLY

BESLY-WELLES CORPORATION
Established as Charles H. Besley & Co. 1875
132 Dearborn Avenue • South Beloit, Illinois



MEN *in the* NEWS

(*Continued from page* 172)

Thor Power Tool Co. — **Frank J. Weitekamp** was elected secretary.

Illinois Tool-Shakeproof, Ltd. — **Wesley R. Johnson** has been named managing director.

Ford Motor Co.—**Carl F. Franz** has been chosen manager of the new manufacturing plant to be built at Indianapolis, Ind.

Timken Roller Bearing Co., Industrial Div.—**Wyn McCoy** has been promoted to sales promotion manager.

Greer Industries, Inc.—**Jacques H. Mercier** has been appointed products manager.

Wellman Bronze & Aluminum Co., Permanent Mold Div. — **Clayton A. O'Neill** is now manager.

Nice Ball Bearing Co.—**Henry M. McAdoo, Jr.**, will become vice-president of manufacturing on July 1; **John J. Larkin**, plant manager; and **Thomas E. Spence**, chief engineer.

Engineering Service, Inc. of America—**Clyde T. Mooney** was made president and general manager, and **Joseph J. Grum** and **K. C. Martens** have become vice-president and secretary-treasurer. respectively.

National Acme Co., Threading Tools Div.—**William E. Bour** was made manager.

Pittsburgh Plate Glass Co., Fiber Glass Div.—**P. Dudley Kaley** is now manager of sales.

Baker-Raulang Co.—**E. E. McVeigh** has been named manager of sales engineering.

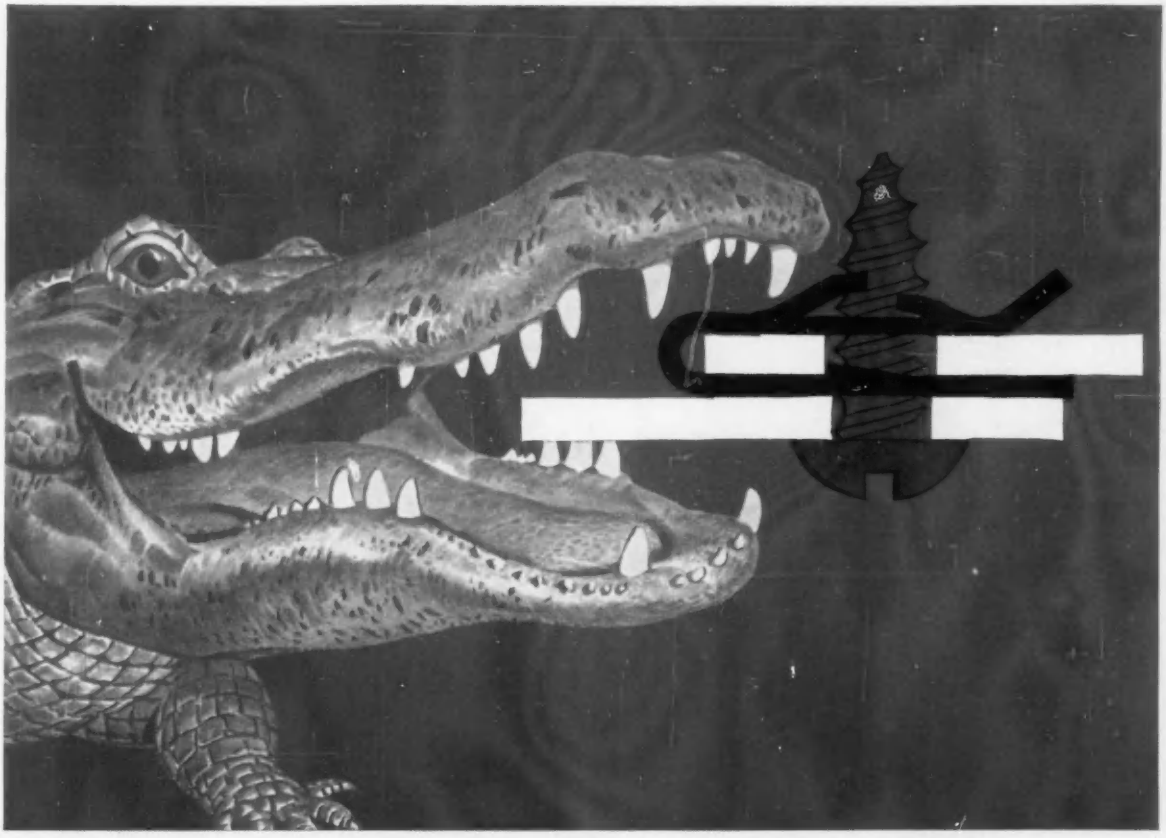
Webb Forging Co.—**Earl Cote** has been elevated to vice-president and general manager.

Ford Div., Ford Motor Co.—**R. C. Armour** is now manager of the Louisville, Ky., assembly plant, while **R. W. Settles** succeeds him as manager of the Long Beach, Calif., assembly plant.

Goodyear Aircraft Corp.—**Bernard A. Miske** has been placed in charge of advertising and sales promotion functions.

Axelson Manufacturing Co.—**Henry C. Miller** has been made machine tool sales manager.

Climax Molybdenum Co. — **Robert R. Freeman** is now manager of arc-cast molybdenum development.



STEEL JAWS THAT NEVER RELAX
fasten a fastener in place

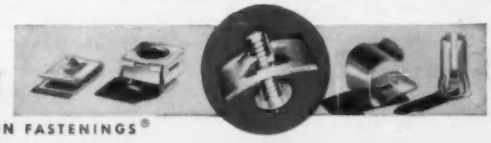
Alligator jaws have nothing on Tinnerman "U" and "J" type fasteners in gripping power. These fasteners press easily into locked-on position over panel edge or center panel locations. Yet they provide positive self-retention, ending the need for welding, staking or other secondary fastening devices. They are ideally suited for blind assembly or hard-to-reach locations.

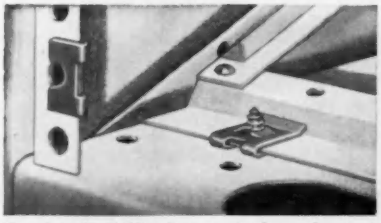
When combined with the familiar Tinnerman SPEED NUT, this unique fastening principle provides a one-piece, self-locking, self-retaining fastener that is fast and easy to apply. The "U" or "J" feature can be combined with wire and tube retainers, latches, catches and a host of other fastening requirements to save time, material and production costs.

Find out about these and more than 8,000 other types of SPEED NUT brand fasteners now serving industry all around the world. They can make important savings for you, can also simplify your assemblies. See your Tinnerman representative soon or write to us. **Tinnerman Products, Inc., Box 6688, Dept. 12, Cleveland 1, Ohio.**

TINNERMAN *Speed Nuts*®

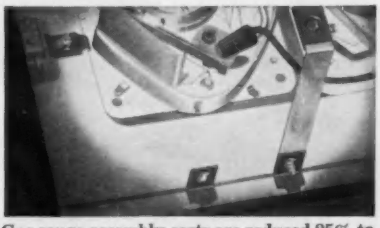
FASTEST THING IN FASTENINGS®





Greater flexibility for control equipment enclosures is provided by self-retaining "J" type SPEED NUTS at 30% less production cost.

Assembly costs on this sheet-metal skylight frame are reduced 66% by Tinnerman "U" type SPEED NUTS.



Gas range assembly costs are reduced 25% to 50% by using Tinnerman "U" and "J" type SPEED NUTS.

Industry News

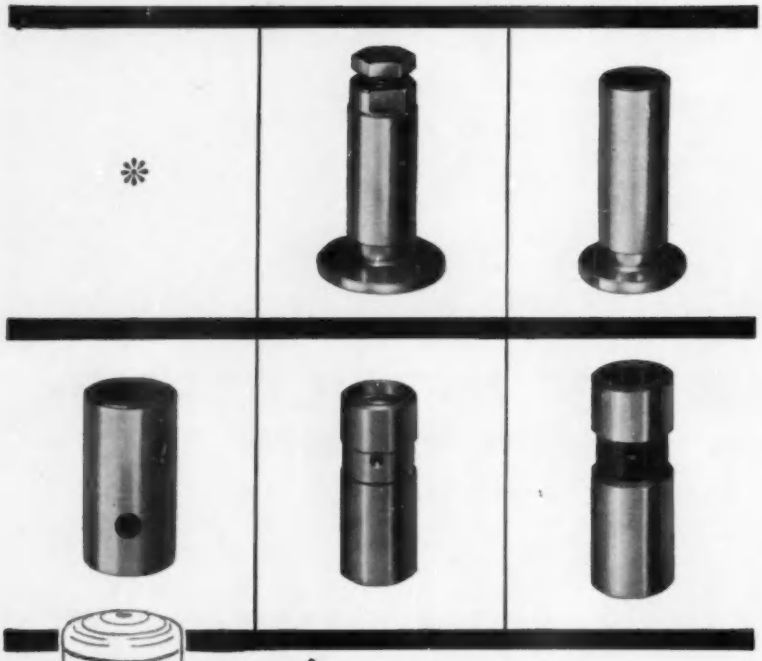
(*Continued from page* 94)

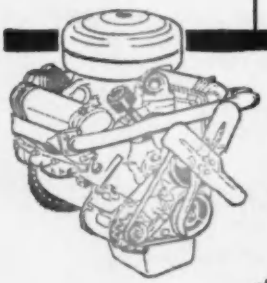
Detroit Armory Chosen Site For Industrial Exposition

The Detroit Artillery Armory has been selected as the site in October of this year for the first of a series of major national industrial expositions under the sponsorship of industry, business, labor, finance and city, state, and Federal Government agencies. The sponsoring groups have formed a national non-profit corporation called the National New Products, New Methods and Patents Exhibit, Inc.; it is headed by Thomas R. Reid of Ford Motor Co.

Athel F. Denham has been named Exposition Director, with headquarters at 927 Book Bldg., Detroit 26, Mich. Plans are being made to accommodate some 250 exhibits at the Detroit show.

JOHNSON *tappets*





keep pace with today's engines

Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration. Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance. Serving the AUTOMOTIVE — AIRCRAFT — FARM — INDUSTRIAL — MARINE Industries.

"tappets are our business"

JOHNSON JP PRODUCTS

MUSKEGON, inc. MICHIGAN

TV Camera Used To Observe Suspensions On Test Cars

The automobile industry has put television to another use. General Motors engineers are using television cameras to observe the behavior of suspension systems during road tests.

A small bomb-shaped television camera is attached to the underside of the car's front or rear bumper and aimed at the portion of the suspension to be studied. The picture is transmitted by closed circuit to a television screen located either inside the test car or in the laboratory.

State Role in Highway Program Stressed at NHUC Conference

Interest in the proposed Federal highway program and its impact on the states drew a large attendance to the recent Sixth Highway Transportation Congress. Held last month in Washington, D. C., under the sponsorship of the National Highway Users Conference, the meeting took as its theme "Follow Through in the States." Speakers and panelists—both prominent highway transportation figures and public officials—discussed ways to implement any program passed by Congress.

Keynote speaker at the first general session of the Congress was Albert Bradley, chairman of the board at General Motors Corp. Forecasting that there will be an even greater demand for motor vehicles during the next decade, he predicted that the number of vehicles in use may be well over 80 million by 1966.

Mr. Bradley went on to express confidence that Congress will soon enact legislation authorizing the proposed $51.5 billion, 13-year highway construction program. However, he cautioned that it should not be regarded as a complete cure for the nation's highway deficiencies. He stressed the fact that the responsibility for the solution to much of the problem must be carried out at state, county, and metropolitan levels.

New GM Parts Warehouse Going Up In St. Louis

A 380,000 sq ft parts depot is being constructed by General Motors in St. Louis to house facilities now located at the Chevrolet assembly plant in that city. When completed in early 1957, the one-story building will stock up to 10,000 Chevrolet parts and an almost equal number of parts for other GM cars.

(*Turn to page* 180, *please*)

Do your machines have a built-in FUTURE?

LEES-BRADNER Model 7-HD
HEVI-DUTY HOBBING MACHINE

Rated capacity in steel	4 D. P
Capacity between centers	25"
Maximum Hob Size	4"x4"
Max. dia. capacity with 4" hob	7"
Max. dia. capacity with 3" hob	8"
Axial shift of hob	3"
Weight	9,300 lbs.

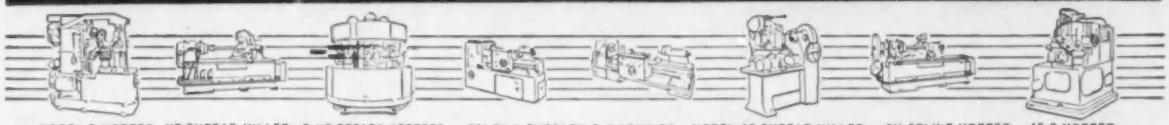
Yesterday's machines were engineered for yesterday's requirements. But the pace of modern industry has changed. The machines you bought yesterday are hard-put to meet today's production demands. They may need replacement.

When you buy your new machine, gear your thinking to the future. Meeting today's production needs is not enough—your machine *must* have a built-in future. It must be engineered to fit tomorrow's production picture, TODAY!

The Lees-Bradner Company manufactures a complete line of hobbing machines that are designed to meet varied requirements. For example, the new 7-HD, Hevi-Duty Vertical Production Hobbing Machine is built to hob *today* at tomorrow's higher feeds and speeds. It's a heavier, more powerful machine equipped to meet industry's demands for savings in time and labor. It has a built-in future, a reserve capacity to produce for today's industry *and* tomorrow's, as well. Your Lees-Bradner representative will be glad to give you the facts. Or, write us direct.

The LEES-BRADNER Company

CLEVELAND 11, OHIO, U. S. A.



MODEL R HOBBER · HT THREAD MILLER · 7-HD ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER

NEW OAKITE CLEANERS
GIVE YOU MORE FOR YOUR
PAINT-PREPARATION DOLLAR

Here are 4 ways to end pre-paint metal-cleaning troubles

Does your trouble chart show that you need better cleaners, strippers or surface conditioners?

- ☐ Cleaning solution foams excessively in spray washing machine. See 1 below.
- ☐ Streaky discolorations or powdery residues cling to surface of steel parts being stripped for repainting. See 2.
- ☐ Zinc phosphating process too difficult to control . . . Iron phosphating process doesn't show good results in salt spray tests. See 3.
- ☐ Too many operations—cleaning, pickling, neutralizing, etc.—are needed to prepare steel that does not require phosphating before painting. See 4.

Here are brief descriptions of new Oakite materials designed to end these particular troubles:

1. For a spray washing solution that does not foam at high pressure, try Oakite Composition No. 161. Does not attack aluminum.
2. For stripping pigmented paint, phosphate coatings and undercoat rust *in one operation*, try Oakite Rustripper.
3. For a zinc phosphating process that is truly easy to control, try new Oakite CrysCoat SW . . . For salt spray results far beyond the capacity of ordinary phosphating processes, try new Oakite CrysCoat No. 89.
4. For *one-operation* removal of rust, heat scale, welding residues and light soil together with good preparation for painting, try Oakite Compound No. 131. Inhibited against attack on steel.

FREE Check the coupon and we will send you free booklets or bulletins with full information on new Oakite cleaners.

OAKITE

OAKITE PRODUCTS, INC.
28A Rector Street, New York 6, N. Y.

Send me free booklets or bulletins giving complete information on the new Oakite materials checked below:

- ☐ Oakite Composition No. 161
- ☐ Oakite Rustripper
- ☐ Oakite CrysCoat SW
- ☐ Oakite CrysCoat No. 89
- ☐ Oakite Compound No. 131

NAME _____

COMPANY _____

ADDRESS _____

Industry News

(*Continued from page* 178)

GERMAN PINT-SIZE CAR

BMW Isetta Kleinwagen is powered by an aircooled, one-cylinder rear engine with an output of 13 bhp at 5200 rpm and a compression ratio of 7:1. Expected to be available in the U.S. soon, the car is said to seat two adults and a child comfortably.

Hertz Planning to Enlarge Fleet by 14,000 Vehicles

One of the automobile industry's biggest customers, the Hertz Corp., national car rental organization, plans to purchase 14,000 more vehicles during the next year. The order will include 10,000 cars and 4000 trucks, for which the company will pay approximately $40 million.

Hertz and its subsidiary — Hertz Rent-A-Car System, Inc.—now have more than 32,000 vehicles in operation, including 16,500 cars and 16,000 trucks. It recently acquired more than 4000 units from R. S. Robie, who operated the vehicles for 25 years under an agreement with Hertz.

New Ford Film Pays Tribute To Raw Materials Producers

A new motion picture, which points up the role many non-automotive industries play in the growth of an automobile company, has been produced by Ford. It is available to schools, churches, and various other organizations. In addition to scenes taken inside car plants, the film shows workers on farms and mines and suppliers who provide materials for automobile parts. Titled "The Ford People," the film is available from the company's film libraries in New York, Oakand, Calif., and Dearborn, Mich.

(*Turn to page* 182, *please*)

SPECTOR...Chicago's largest... standardizes on Fuller ROADRANGERS®

Spector Freight Systems, Inc., largest common carrier with home offices in Chicago, is adding 104 new tractors equipped with R-46 ROADRANGERS to bring a total of 257 ROADRANGER equipped tractors to its fleet.

Referring to Spector's 149 tractors now equipped with Fuller 8-speed ROADRANGERS, to 4 tractors equipped with 10-speed ROADRANGERS . . . and to the 104 new units with 8-speed Model R-46 ROADRANGERS, C. L. Lunt, Vice President, Operations, says:

"We have standardized on the ROADRANGER Transmission for better over-all fleet performance and less maintenance . . . resulting, of course, in a substantial dollar savings. Also, our drivers overwhelmingly prefer the semi-automatic Fuller ROADRANGER Transmission."

C. L. Lunt, Vice President, Operations

Spector, whose gross revenues rose from $1½-million in 1945 to an estimated $21-million in 1955, *knows* the value of better over-all fleet performance. Spector drivers prefer ROADRANGER 8 and 10-speed Semi-Automatic Transmissions with:

- **Easier, quicker shifts—all forward speeds in short closely spaced steps between ratios**
- **One shift lever that controls all forward speeds**
- **No gear splitting—all selective gear ratios are evenly and progressively spaced**
- **Higher average road speeds—engines operate in peak hp range with greater fuel economy**
- **Less driver fatigue—⅓ less shifting**
- **Range shifts pre-selected—automatic and synchronized**

• • •

Compact space-and-weight-saving economies permit more cargo to be carried on payload axles. Get full facts on ROADRANGER from your truck manufacturer or truck dealer, now!

FULLER MANUFACTURING COMPANY
TRANSMISSION DIVISION • KALAMAZOO, MICH.

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.

CASE HISTORY 1

REQUIRED:
A dependable supply of this small, machined electrode to meet customer's quality and quantity needs at reduced cost.

HASSALL SOLUTION:
Hassall-designed re-heading process, involving no critical dimension changes, resulted in a 59% cost reduction to customer.

CASE HISTORY 106

REQUIRED:
Replacement for stud with insufficient head to act as stop for automatic hammering.

HASSALL SOLUTION:
Substitution of Hassall cold-headed collar stud with annular threads for greater holding power. Substantial cost savings.

CASE HISTORY 64

REQUIRED:
An economical method of manufacturing perforating punches out of hard materials such as drill rod.

HASSALL SOLUTION:
The Hassall cold-heading process plus engineering skill overcame the difficulties presented by these alloys at considerable savings.

CASE HISTORY 37

REQUIRED:
Bumper bolt with bonded rubber cap for license plate support.

HASSALL SOLUTION:
The large head on this bolt would ordinarily call for screw machining but the two lugs under the head ruled this out. Progressive cold-heading was Hassall's answer.

SPECIALTY MANUFACTURER OFFERS SAVINGS ON SMALL PARTS AND FASTENERS

Multiply these case histories a thousandfold and you'll get some idea of the variety of tough problems we crack, and the savings we effect for our customers in the course of a year.

Our cold-heading process—supplemented by secondary operations—imposes amazingly few limitations on the parts and fasteners we can make. Don't forget that we are not limited to "stock" sizes. These illustrations show that Hassall—a specialty supplier—can show you substantial savings, better deliveries and technical assistance on your small parts and fasteners.

Proof? Send us your specifications or write for catalog.

John Hassall, Inc., P. O. Box 2194 Westbury, Long Island, New York.

HASSALL

SINCE 1850

NAILS, RIVETS, SCREWS AND OTHER COLD-HEADED FASTENERS AND SPECIALTIES

Industry News

(*Continued from page* 180)

Richmond Disposes of Interest In Three Detroit Gear Concerns

Financier Frederick W. Richmond has relinquished control of three Detroit gear companies to Edgar D. Leon, president of Gear Grinding Machine Co. Valued at $6.5 million, the companies include Gear Grinding and two of its subsidiaries—Detroit Bevel Gear Co. and Republic Gear Co. Richmond during the past several months has been concentrating his holdings on a number of companies in the East.

Fifteen Per Cent of Plymouth Output Goes to Station Wagons

Plymouth reports that station wagons are accounting for 15 per cent of its total sales, a three per cent increase over 1955. While suburban living has greatly influenced the station wagon business in the last few years, sales in larger cities nearly parallel those in the suburbs. According to a company survey, 44 per cent of the Plymouth station wagon owners live in outlying areas, while 41 per cent constitute residents in larger cities.

$5 Million Research Center Planned At Harvester Farm

A $5 million research and engineering center is being planned by International Harvester Co. for its farm tractors and implements. The center would be located on the company's 440-acre experimental farm southwest of Chicago, if local restrictions can be eased. It would include several shops for constructing experimental farm machines.

All-Time High of 4.5 Million Vehicles Scrapped Last Year

Vehicle scrappage in 1955 rose to an all-time high for the fourth consecutive year. Although official figures on the number of units junked last year will not be ready for several months, a preliminary count shows that more than 4.5 million units hit the junk heap in 1955.

Included were four million cars and 555,000 trucks. The number of cars scrapped increased by 5.4 per cent above the 1954 high of 3.795 million, while trucks rose by about 7.1 per cent above the 518,000 units junked in 1954.

(*Turn to page* 184, *please*)

Engines are quiet as a mouse

THANKS TO

HOUDAILLE

CONDUIT TUNING*

In Air Cleaner-Silencers

*Patents Pending

Conduit Tuning...Houdaille's advanced principle of sound control for air cleaner-silencers...does not require critical adjustment to specific frequencies. It functions over a broad range...hence does away with more noises than do resonator-type units. Conduit Tuning cuts cost by simplifying design...lowers height requirements to conform with modern low hoods.

Houdaille invites you to investigate Conduit Tuning. Extensive research engineering and testing facilities are at your command in developing and producing air cleaners and silencers of *any* type to meet your specifications.

HOUDAILLE INDUSTRIES, INC.

NORTH CHICAGO DIVISION

1900 FOSS PARK AVE., NORTH CHICAGO, ILL.

OTHER HOUDAILLE PRODUCTS

SHOCK ABSORBERS• BUMPERS• FENDER PANELS• BRAKE LEVERS• DOOR LOCKS• SEAT ACTUATORS• SPECIAL AUTOMOTIVE TOOLS• HYDRAULIC AVIATION EQUIPMENT, AND DROP FORGED CARBON AND ALLOY STEEL HAND TOOLS.

Industry News

(*Continued from page* 182)

Caterpillar Set To Build New Illinois Parts Plant

The Caterpillar Tractor Co. Parts Dept., currently located in Peoria, Ill., will be moved to a new building to be constructed on a 100-acre site in Morton, Ill. Scheduled for completion in 1958, the new unit will employ about 1000 persons. Space vacated at the Peoria plant will be used for production of crawler tractors and Diesel engines.

"Hot Rod" Equipment Industry Centered in Los Angeles Area

Some 150 Los Angeles manufacturers sell nationally many millions of dollars worth of speed and customized equipment for sports cars. The city is also an important center for design and development work.

Speed equipment "best sellers" from the California firms are: manifolds; heads; camshafts; and fuel injectors. Custom equipment items that move best are: stainless steel hood moldings; grill conversion kits, power-operated kits for opening doors, windows, and the trunk; and air cleaners. Ninety per cent of those on the market come from the West Coast.

MISSILE WIRING PUZZLE

Wiring the tail is just a start in the electrical work necessary in the production of Army Redstone missiles at the Missile Operations facility of Chrysler Corp. near Detroit. Approximately 148,000 ft of electrical wiring and 7000 soldered connections must be carefully placed before the wiring operation in missile assembly is completed.

"Open Books" Ruling Made By Court Not Too Serious

A ruling handed down recently by the Supreme Court, stating that a labor union has the right to inspect a company's books when the employer claims he cannot afford a wage increase, is not expected to have any far reaching effects on industry. As it stands now, the ruling is still vague.

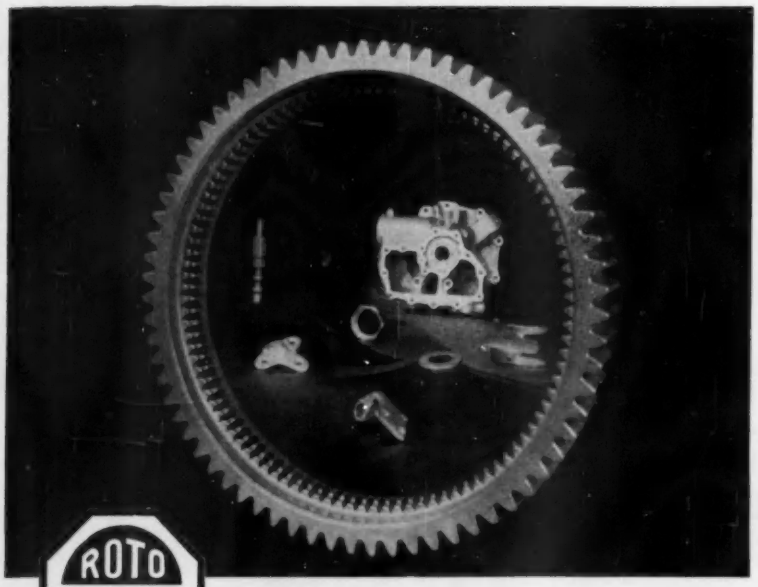
According to the ruling, an employer might be forced to open his books when the union feels the firm is not bargaining in good faith, or is not honest in its arguments. On the other hand, the union also must have valid reasons for its claims, and be able to produce evidence.

Arkansas Court Voids Factory License Law

Forcing through a state law to regulate car manufacturers is one thing, but having it stand up in court may prove quite another. The Arkansas Supreme Court has thrown out such a measure charging that the law was class legislation and unconstitutional in all of its material provisions.

Specifically, the Court held the law in violation of both State and Federal constitutions because it levied a tax on new car dealers, but not on those dealers in used cars. The intent of the act was to protect dealers and purchasers from being forced to accept unwanted accessories on new cars and also to prevent the manufacturer from shipping dealers unordered cars.

(*Turn to page* 188, *please*)



ROTO FINISH

it's the finish that counts!

Roto-Finish maintains exact tolerances on precision parts with no significant dimensional changes. It makes possible a wide range of finishes applicable to parts of almost any size or shape; finishes a variety of materials — at big savings in manpower and costs. Without obligation, send sample unfinished parts to us. Include finished part for guide and your specifications. Roto-Finish will finish parts in its laboratory. You get a complete process report. You are guaranteed results and a finish that counts!

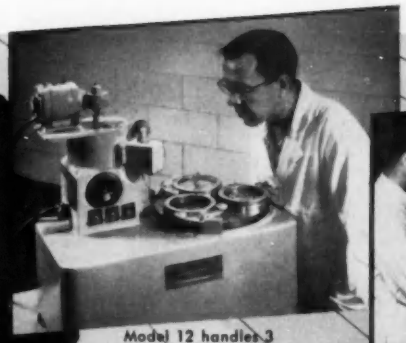
WRITE FOR FACT-PACKED ROTO-FINISH CATALOG NOW

Roto-Finish COMPANY

3713 Milham Road, Kalamazoo, Michigan
Originators of the Roto-Finish Process

P. O. Box 988
Phone 3-5578

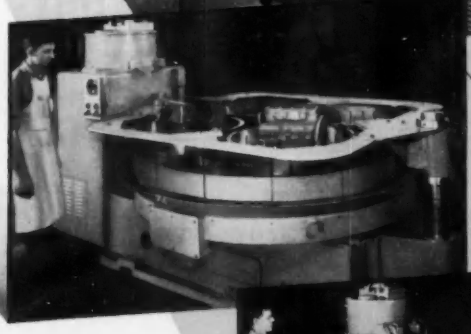
in this line-up . . .



Model 12 handles 3
4-in. dia. parts up to 705
¼-in. dia. parts per load.

Model 24 handles 3
9½-in. dia. parts up to 3900
¼-in. dia. parts per load.

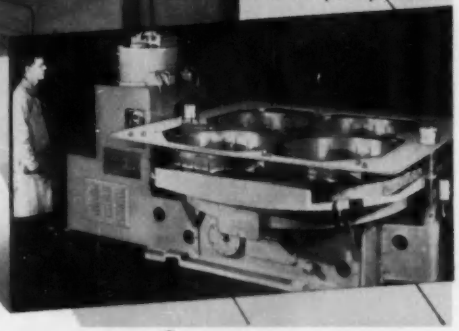
Model 36 handles 4
13¾-in. dia. parts up to 4000
⅜-in. dia. parts per load.



Model 48 handles 4
17-in. dia. parts up to 940
1-in. dia. parts per load.

Model 72 handles 4
27-in. dia. parts up to 2480
1-in. dia. parts per load.

Model 84 handles 4
32-in. dia. parts up to 3500
1-in. dia. parts per load.



there's a specific *Lapmaster*® to give you:

1 *Precision Flatness*

2 *and Finish*

in production quantities

Parts large or small—tall or squat—whatever the case may be, there's a Lapmaster tailor-made to meet your production requirements at the lowest possible cost per piece.

If you are now lapping by other means—hand scraping or grinding—it will pay you to investigate the Lapmaster. Our fully equipped lapping laboratory is at your disposal to analyze your problem, test run a number of pieces and furnish you with a complete production report without obligation.

"John Crane" Lapmasters are capable of consistently producing flatness to less than one light band (11.6 millionths of an inch), micro-inch finishes of 2 to 3 RMS on all materials including cast iron, steel, magnesium, aluminum, brass, carbon, ceramics and plastics.

Crane Packing Company, 6435 Oakton St., Morton Grove, Ill. (Chicago Suburb).
In Canada: Crane Packing Co., Ltd. 617 Parkdale Avenue, Hamilton, Ontario.

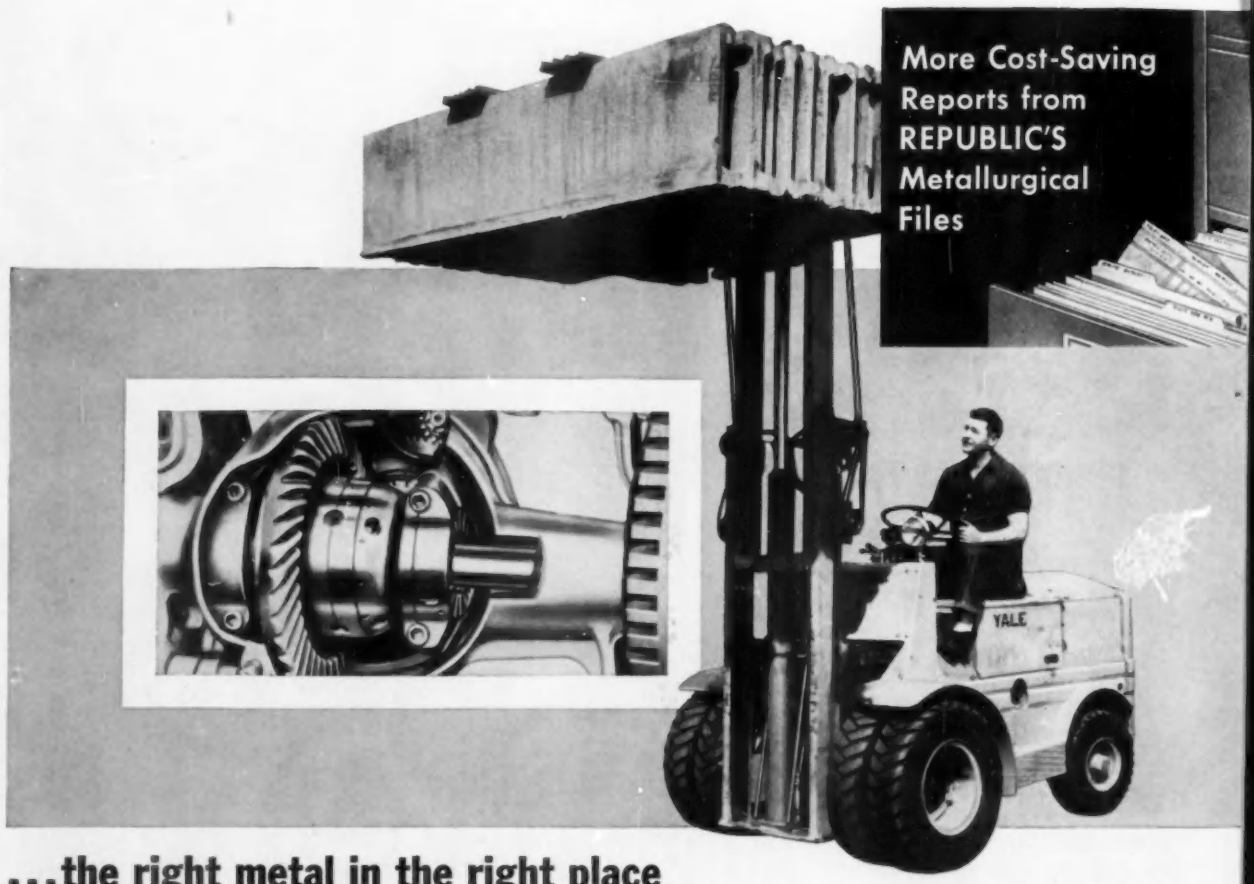
Free data

These 3 booklets on Production Lapping and Light Band Reading are yours for the asking. Write today.

John Crane

MECHANICAL PACKINGS | SHAFT SEALS | TEFLON PRODUCTS | LAPPING MACHINES | THREAD COMPOUNDS

CRANE PACKING COMPANY



...the right metal in the right place

HELPS RAISE LOAD CAPACITY 90,000 POUNDS

At one time, load capacity of lift trucks was restricted to the limits of elevators, usually 2,000 to 10,000 pounds, in multi-storied industrial plants. But with the present trend to one-story plants, the load limit is off.

The Yale & Towne Manufacturing Company, Yale Materials Handling Division, is building lift trucks with capacities as high as 100,000 pounds and using Republic Alloy Steels for vital areas of construction. An outstanding example is the full floating drive axle shown above. The axle, located in the front of lift truck, drives the unit and also bears the full weight of whatever is being lifted.

Prior to the use of Republic 4340 Alloy Steel, this was the part that most frequently failed in service. But, Yale & Towne engineers eliminated this problem by taking full advantage of alloy steel's superior strength and resistance to fatigue, shock and stress.

Republic Alloy Steels provide a combination of qualities essential to designing smaller sections to carry heavier loads with no sacrifice of strength or safety. You will find the highest strength values in these fine steels—plus an exceptionally high strength-to-weight ratio that permits the transmission of hundreds of horsepower through tough, strong axles, shafts and gears free from excess weight.

Add to these qualities a uniform response to heat treatment that produces hard, wear-resistant surfaces around tough cores; and you have a material that insures safety, extends equipment life, and cuts maintenance and replacement costs.

If you have a problem involving any one of these factors, Republic metallurgists and engineers are ready to assist you in the most efficient and economical application of these fine alloy steels to your product. The coupon will get things started.

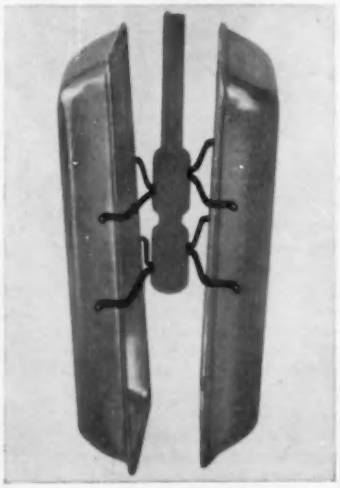
REPUBLIC

REPUBLIC STEEL

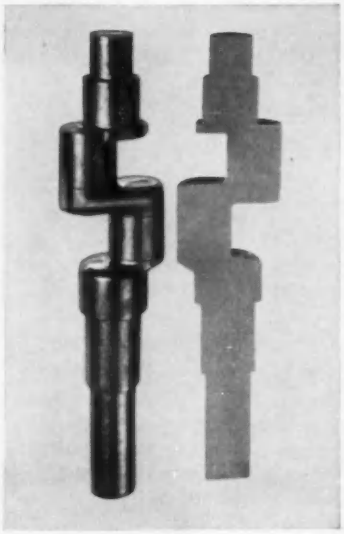
World's Widest Range of Standard Steels

Republic Titanium helps ice tray manufacturer increase anodizing rack life 100 times.

This company formerly used aluminum as rack material for anodizing ice trays and grids. But, its use was expensive and time-consuming. A considerable amount of aluminum dissolved during each anodizing and stripping cycle, and a stripping operation was required to remove anodic film formed for electrical contact on the previous cycle. Then the manufacturer switched to commercially pure Republic Titanium. The result? Rack life increased 100 times. Stripping operation eliminated. Stubborn resistance to chemical attack of cleaning, etching, brightening and anodizing solutions. Republic will help you apply Titanium to parts that must stand up to severe service. Write us.



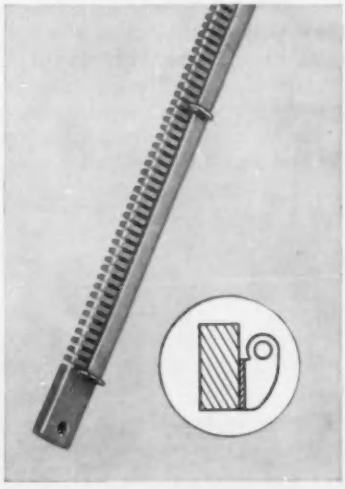
Republic Chateaugay Pig Iron provides excellent surface, dimensional accuracy, uniform grain structure in ductile iron castings.



These two views of a shell-molded, ductile iron crankshaft show the excellent surface and the fine, uniform grain structure of the interior. Unseen is the high tensile strength, wear-resistance and top machinability provided by Chateaugay, Republic's exclusive premium Pig Iron. Chateaugay's high-carbon, low-phosphorus, copper-free content makes it ideally suited to ductile iron use. A Republic Pig Iron Metallurgist will show you, without cost or obligation, how Chateaugay consistently outperforms other pig irons. Check the coupon below if you would like a Pig Iron Metallurgist to call.

Republic Cold Drawn Special Sections cut machining costs on typewriter margin rack.

This part is produced at less cost because most of the machining has been eliminated. The manufacturer uses Republic Cold Drawn Special Sections that are preformed to the predominating cross section of the part. If you produce or design steel parts and are interested in reducing costs, you'll want to know more about these advantages of cold drawn special sections. (1) Almost limitless flexibility in design. (2) One-piece shapes replace costly assemblies. (3) Simplification of built-up, inter-locking or associated parts. (4) Benefits of cold drawing including higher strength, greater hardness, a bright, smooth finish that rarely requires further machining. Made to specification in all grades of carbon, alloy and stainless steel.



STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-1647
3106 East 45th Street, Cleveland 27, Ohio

Send more information on:
☐ Alloy Steels ☐ Titanium ☐ Special Sections
☐ Have a Pig Iron Metallurgist call.

Name_____ Title_____

Company_____

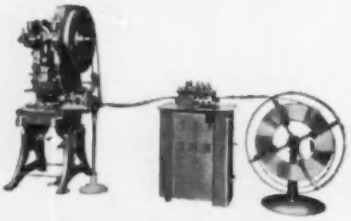
Address_____

City_____ Zone____ State_____

FLEXIBILITY
in Stock Straightening

WITTEK
STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes—Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars

WITTEK Manufacturing Co.

Production Feeding Equipment

4319 W. 24th Place • Chicago 23, Illinois

Industry News

(*Continued from page* 184)

Car Production Now at Rate Of Six Million Units Yearly

Further cutbacks in automobile production this month (June) are expected to reduce second quarter output to about 1.4 million units, or about 300,000 under the 1.7 million cars turned out in the first three months. If present schedules hold, it would give the industry a total of 3.1 million cars for the first half of this year, compared with 4.2 million turned out in the same period last year.

This would indicate that the industry is now producing at an annual rate of slightly above six million cars. How much above that figure the industry will be able to go this year will depend, of course, on production in the final quarter.

Chrysler, Stewart-Warner Push Drive For Engineers

Chrysler Corp. and Stewart-Warner Corp. are stepping up their efforts to encourage more students to enter the engineering profession. Chrysler has issued a booklet titled "The Forward Look and Your Engineering Career," in an attempt to draw additional capable engineers into its organization.

The booklet points out the advantages of an engineering career with the corporation and lists the various areas of opportunities in a number of engineering fields. It can be obtained free from Technical Personnel Procurement, Chrysler Corp. Engineering Div., Box 1118, Detroit 31, Mich.

Stewart-Warner now is offering four-year engineering scholarship to qualified high school students who have taken competitive tests, effective with the fall term. The scholarships include three for mechanical engineering and one for electrical engineering.

Armour Research Plans $5 Million Expansion

Three new buildings and additions to existing units are included in a program designed to expand research work at the Armour Research Foundation of the Illinois Institute of Technology in Chicago. To be spread over the next ten years, the building program is expected to cost about $5 million.

GASKET CUTTERS

—"supply" is no problem when you can count on

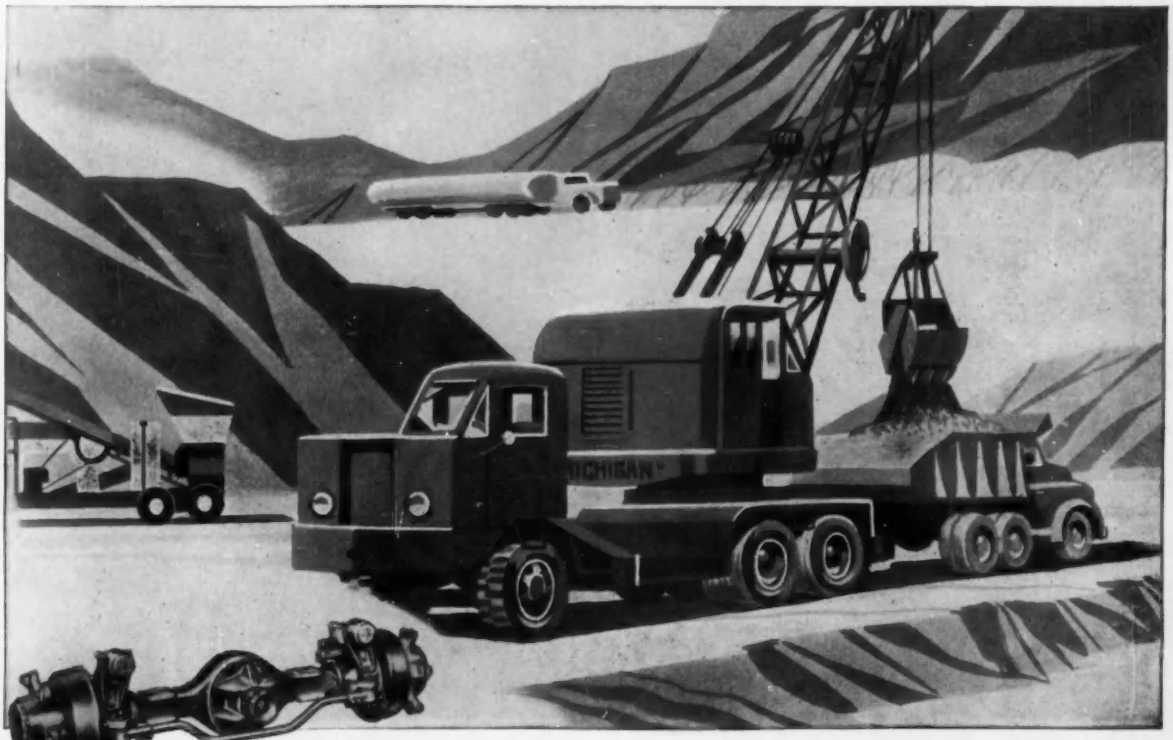
- PROVEN QUALITY
- ON-TIME DELIVERY
- COMPETITIVE PRICES

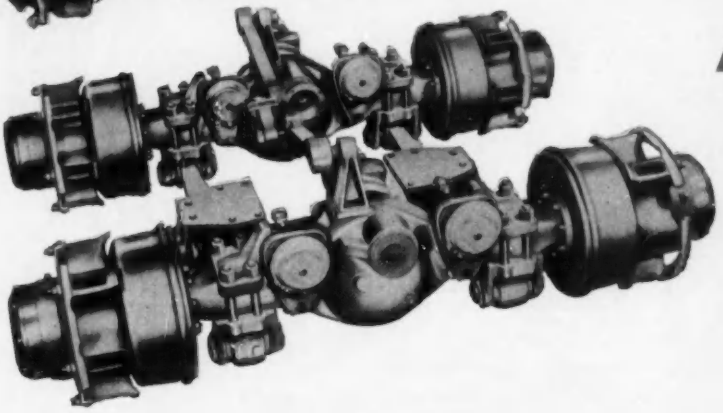
• World Bestos Packing Division of Firestone offers a dependable source of supply for finest quality sheet stock . . . using specially compounded binders of neoprene, GRS synthetic rubber and natural rubber.

World Bestos' modern equipment and ample plant capacity assure on-time delivery . . . at competitive prices. Firestone's extensive research and quality control facilities assure formulations and finished sheets of proven quality and uniformity. World Bestos is now supplying leading gasket cutters with sheets manufactured to S.A.E. and government specifications. Stocks are carried to meet emergency needs.

Write today for complete information on your requirements. Engineering assistance is available.

WORLD BESTOS
NEW CASTLE, INDIANA
PACKING DIVISION OF THE
Firestone
TIRE AND RUBBER CO.





A rugged answer to *any* tough 6-WHEEL DRIVE problem

Here's a reliable guarantee of a long, useful, profitable life for a hard-working 6 x 6 vehicle—this husky combination:

- **a Clark steering-drive axle for the front**
- **two Clark non-steer drive axles in tandem at the rear**

These are true heavy-duty units—amply strong to carry tremendous loads, ruggedly built to deliver torque to the wheels with dependable efficiency.

Always, wherever you find it, this is a "Quality Specification" . . . CLARK AXLES.

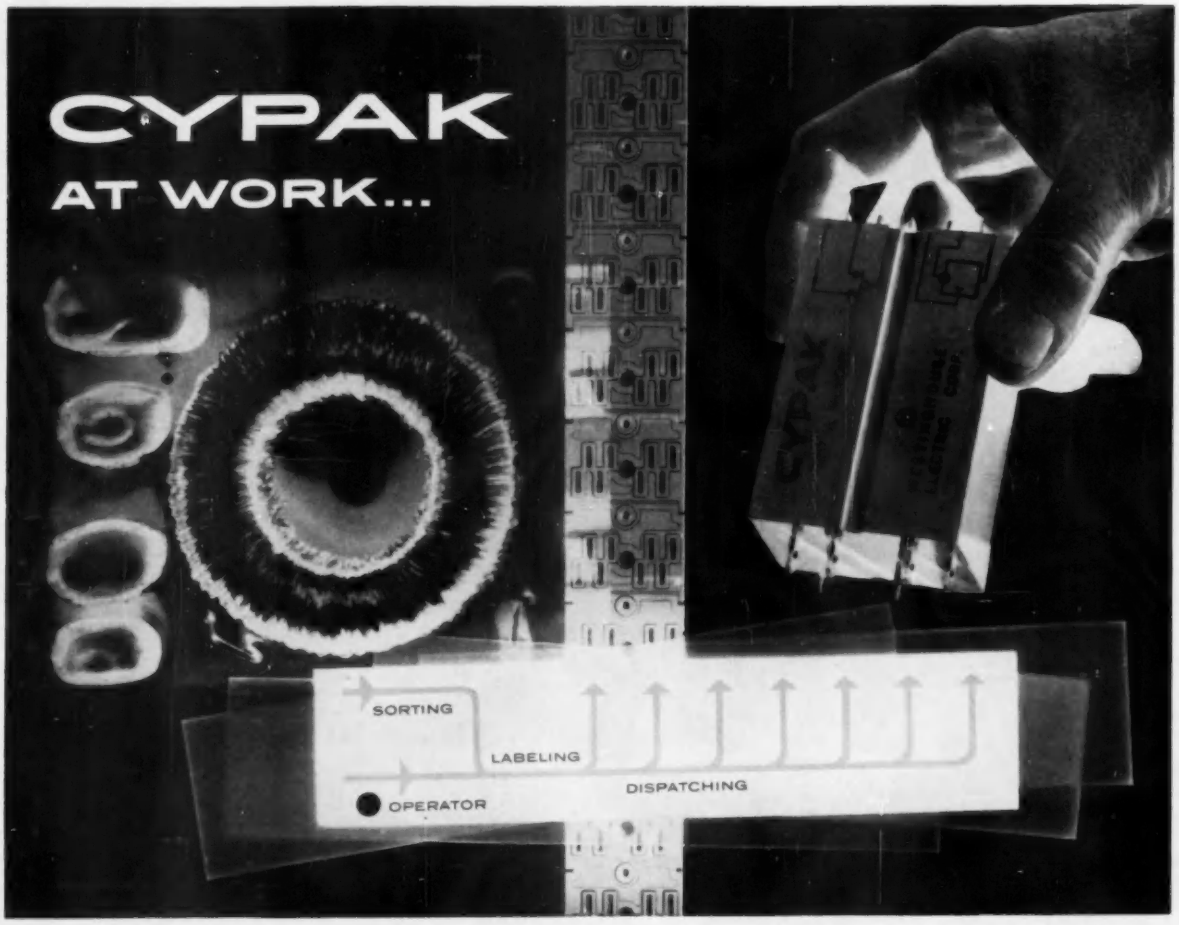
Are you constantly studying how to increase efficiency and decrease costs in that vital area between fly-wheel and tires? Talk to Clark: for in that "vital area" is where Clark can help you; a fact well known to a number of leading equipment manufacturers—to their profit.

CLARK® EQUIPMENT

As a practical Step 1, send for the handy, pocket-size Clark Products book—for a clear idea of why it's **"good business to do business with Clark."**

CLARK EQUIPMENT COMPANY, Buchanan, Michigan

OTHER PRODUCTS OF THE CLARK AUTOMOTIVE DIVISION—
TRANSMISSIONS • AXLE HOUSINGS • TRACTOR UNITS • TORCON TORQUE CONVERTERS
ELECTRIC STEEL CASTINGS • GEARS and FORGINGS • FRONT and REAR AXLES for TRUCKS, BUSES and OFF-HIGHWAY EQUIPMENT.



more complete automatic control of material-handling systems

Now, with Westinghouse CYPAK*, you can fulfill your needs for more complex electrical control functions . . . without adding more sources of trouble. You see, CYPAK has no moving parts to wear, corrode or jam. The result: greater control reliability in material-handling systems and none of the usual control maintenance costs.

CYPAK operating life is many times longer than that of conventional relays. And CYPAK systems have complete physical protection. Each control element is enclosed in a plastic block that is plugged-in—locked-in to a common power channel.

These are some important ways CYPAK will back you in broader application of weighing, sorting, dispatching, and storing conveyor system applications. Your Westinghouse representative has more information on steel, paper, rubber and other industrial applications. Call him today. Or write Westinghouse Electric Corporation, Dept. B, P. O. Box 868, Pittsburgh 30, Penna.

*Trade-Mark
J-21962

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING **TODAY!***

Torqmatic makes the load go faster

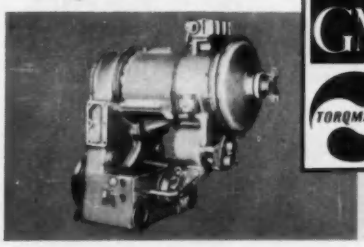
CALL THE ROLL of leading shovel-type loaders and you'll find that almost every one of them – like Payloader, Trojan, Napco, Speedall and Scoopmobile– uses Allison TORQMATIC DRIVES in both gasoline- and Diesel-powered loaders.

And the reason is simple – the *integrated* Allison TORQMATIC Converter-Transmission team helps manufacturers build a better loader–gives their customers an easier-operating, faster-working tool that costs less to run and maintain.

For the completely self-contained TORQMATIC DRIVE frees drivers from clutch-pedal pushing – eliminates about half the work in running a shovel-type loader.

The TORQMATIC CONVERTER permits quick-shifts *of all ranges* at full throttle without slowing down – broadens the engine's useful horsepower range by tripling engine torque for faster, more efficient digging and hauling. And "sense-feel" hydraulic control enables the operator to feel the load pick-up when reversing direction.

If you'd build or buy a better shovel-type loader, take a TORQMATIC tip from the leading manufacturers–specify Allison TORQMATIC DRIVES. For full details write to Allison Division of General Motors, Box 894A, Indianapolis 6, Indiana.



GM TORQMATIC

Allison

TORQMATIC DRIVES

Here's quality in a wide variety . . . and it starts with the basic material

. . . YOUNGSTOWN COLD FINISHED BARS

Lamson & Sessions bolts, nuts and cap screws have established a world-wide reputation as fasteners of quality and dependability. To gain such a reputation is not accidental. It is, rather, the result of careful planning, exact selection of materials and precision manufacturing. The basic material, as an example, is Youngstown Cold Finished Bars.

The uniformly high quality of Youngstown Cold Finished Bars makes possible uniform products. It is a uniformity that starts in the Bessemer or Open Hearth and is maintained throughout manufacture. Composition, structure and surface conditioning combined with "know how" in cold finishing, assure the highest quality. Specify Youngstown - - your best assurance of quality.

QUALITY YOUNGSTOWN SERVICE

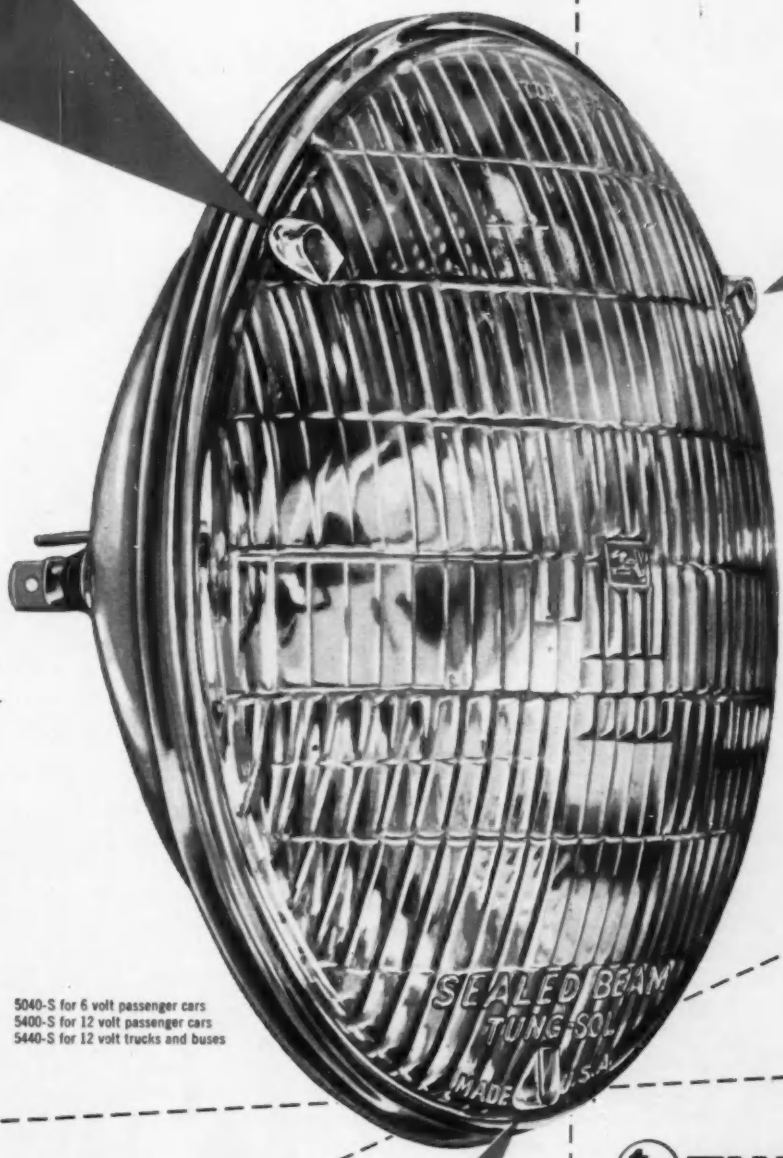
Youngstown COLD FINISHED BARS

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

VISION-AID HEADLAMPS



5040-S for 6 volt passenger cars
5400-S for 12 volt passenger cars
5440-S for 12 volt trucks and buses

now with

E-Z AIM PLATFORMS

Precision-molded platforms for accurate beam adjustment with all approved aiming devices

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Cleveland *Top Quality* Fasteners give you EXTRA Fastenability

(Big word that means extra fast trouble-free driving them in where you want them)

"The usual industry quality standards aren't high enough," Cleveland engineers were told. "Start there and work up."

What they have accomplished shows up in lower assembly costs in your shop—via super-accurate forming to close tolerances, scrupulously clean threads with perfect concentricity and uniform lead, flawless washer faces, sharp cornered heads that won't slip in your tools, points flat and normal to the screw's axis . . . all of which mean extra fastenability.

Higher tensile too—these cold forged double-extruded cap screws made by Cleveland's own Kaufman Process now give you extra margins of strength.

No extra charge for any of these fasteners that help you put together a better product. Ship-at-once stocks of every kind and size we make! Ask your jobber for Cleveland Fasteners—or write us for latest stock list.

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Originators of the
Kaufman DOUBLE EXTRUSION Process

The Cleveland Cap Screw Company

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Will your income and location allow you to live in a home like this...spend your leisure time like this?

They can...if you start your Douglas career now!

Your objectives are probably high professional standing, good income, good security and good living. All four can be achieved at Douglas.

Douglas has the reputation of being an "engineer's outfit," with the three top administrative posts being held by engineers. Maybe that's why it's the biggest, most successful unit in its field. Certainly it offers the engineer unexcelled opportunities in the specialty of *his* choice ...be it related to missiles or commercial or military aircraft.

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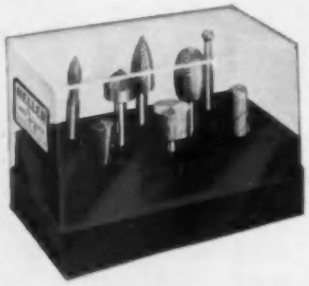
get longer life with

HELLER ROTARY FILES



Popular Assortments of HELLER Rotary Files available in four different combinations of Hand Cut and Ground-From-Solid.

Special analysis, high quality steel, plus precision manufacture make each HELLER Rotary File last longer—and cut faster. HELLER'S Regrinding Service restores them to service at a fraction of their original cost—thereby extending their useful life and saving you money.

Available in a full range of shapes and sizes, HELLER'S complete line includes Handcut, Ground-from-solid, Carbide Burr and Miniatures.

For more than 100 years HELLER has been first in files. Now you can get HELLER quality in any type of file you need.

Write for Catalog R-48 for Rotary File information.

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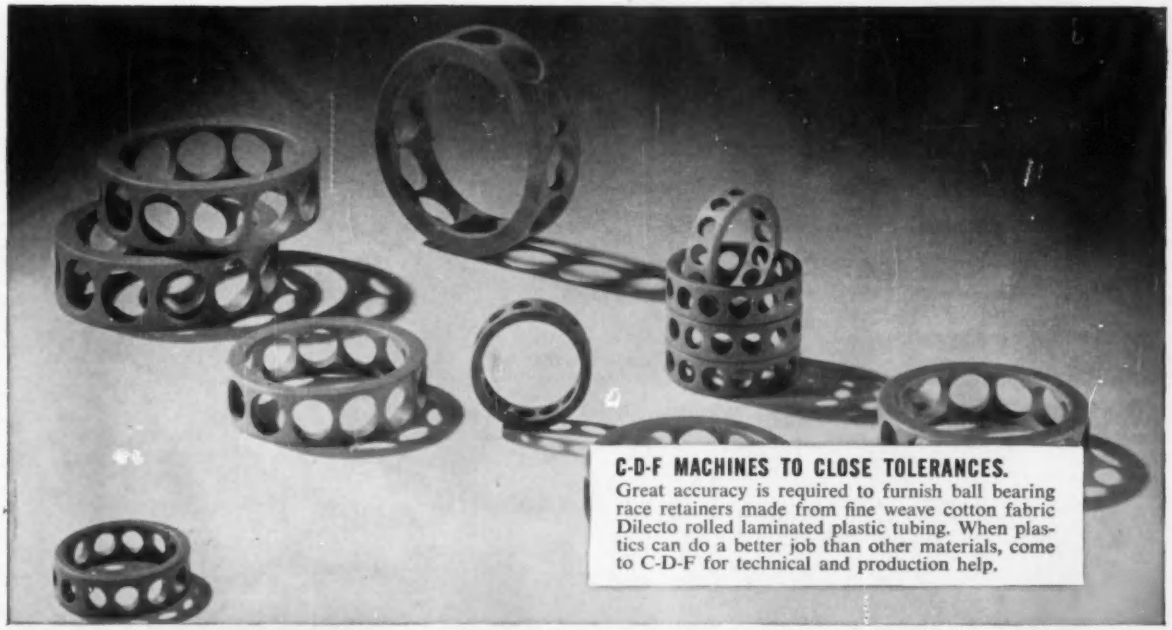
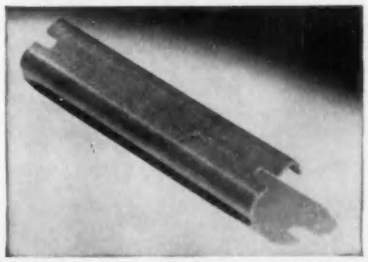
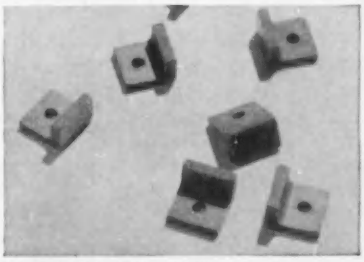


C-D-F MACHINES TO CLOSE TOLERANCES. Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



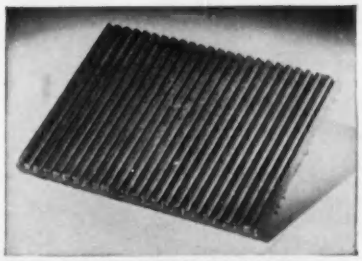
C-D-F PIONEERED IN POST-FORMING of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.



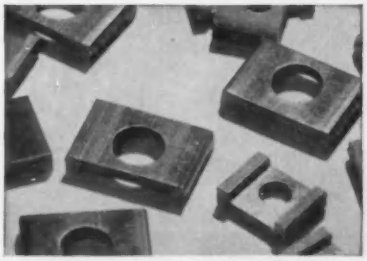
C-D-F DOES THE UNUSUAL. These rubbing blocks are made from fine-weave cotton cloth Dilecto molded *tubing* that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.

C-D-F SPECIALIZES IN AUTOMATIC SCREW MACHINING of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

Yes, C-D-F is a big reliable source for fabricated plastics!



C-D-F SERVES MANY INDUSTRIES with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.



C-D-F IS A PUNCHING SPECIALIST on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.

C-D-F COMES UP WITH THE ANSWERS to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.

CONTINENTAL DIAMOND FIBRE

CONTINENTAL-DIAMOND FIBRE DIVISION OF THE BUDD COMPANY, INC.

NEWARK 2, DELAWARE

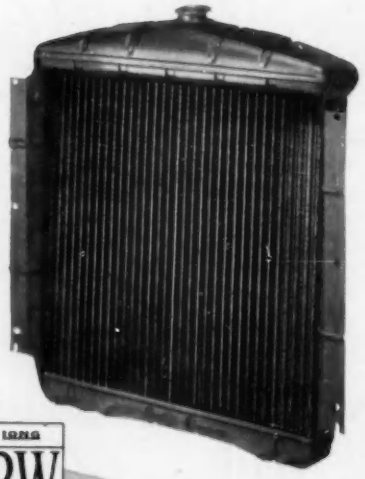
Installation of the most modern equipment, doubling our engineering and other specialized personnel are but some of the factors contributing to our newly increased productivity and efficiency.

Long's experience in quality manufacture includes over a half century of volume production for American industry. The progressive policies of Borg-Warner—of which we are a Division—set new goals in expanding our engineering and production service.

We direct you to the advantages of meeting your cost and delivery requirements through recent developments and new applications of our products. We're eager to tell you about them in detail.

NEW LONG RADIATOR BOTTOM TANK OIL COOLER

Simply and economically placed in the lower tank of the radiator this new Long-designed oil cooler in one neat out-of-the-way package maintains desired oil temperature for engine and or transmission. They are available in a variety of lengths, thicknesses and multiple wafers, and are now in volume production at Long.



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Long radiators make the most efficient use of material and provide a more rugged construction at competitive prices. Long's outstanding engineering facilities are available to you for design and building of any type of radiator or heat exchanger.

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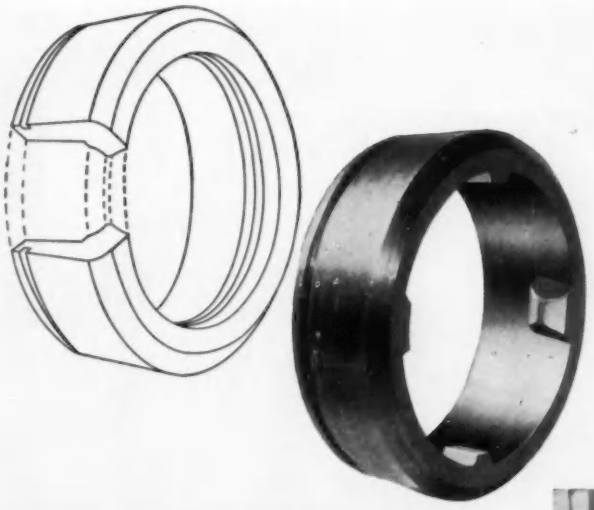
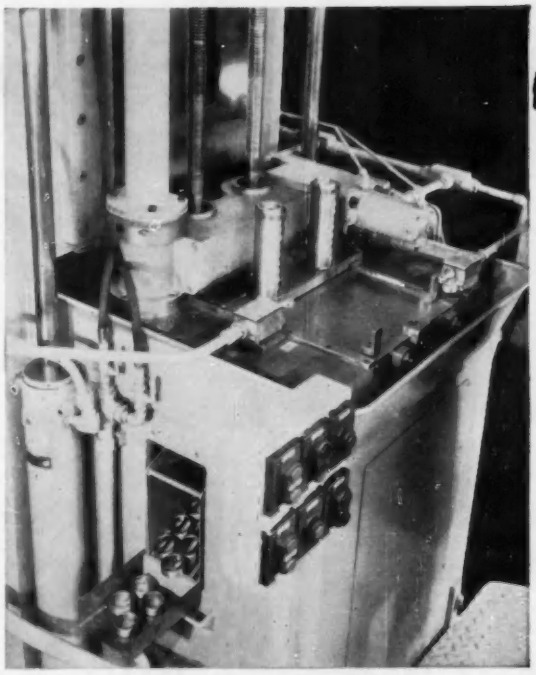
Also: Windsor and Oakville, Ontario

THE STANDARD OF QUALITY AND PERFORMANCE SINCE 1903

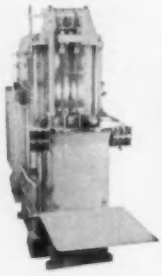


I. D. and four inverted helical splines BROACHED the American way

. . . 300 parts per hour



MACHINE
American two-station, pull-down broaching machine with spiral drive unit.



FIXTURES
American hydraulic slide unit with feed tubes and automatic clamping and ejection mechanism.

BROACHES
American combination round-and-spline broaches with helical spline teeth.

American engineering made this broaching operation fast, automatic and economical.

The finished inside diameter and four inverted helical splines are broached, in this automotive synchronizer ring, two at a time . . . 300 per hour.

American special combination round and spiral spline broaches are used to cut the splines concentric with the I.D.

The broach shanks are threaded through the rings, before they are clamped, in order to start the broaches through the parts, concentric with the holes.

Feed tubes are here shown as manually loaded but are readily adapted to automation. Parts are fed and ejected by automatic hydraulic slides.

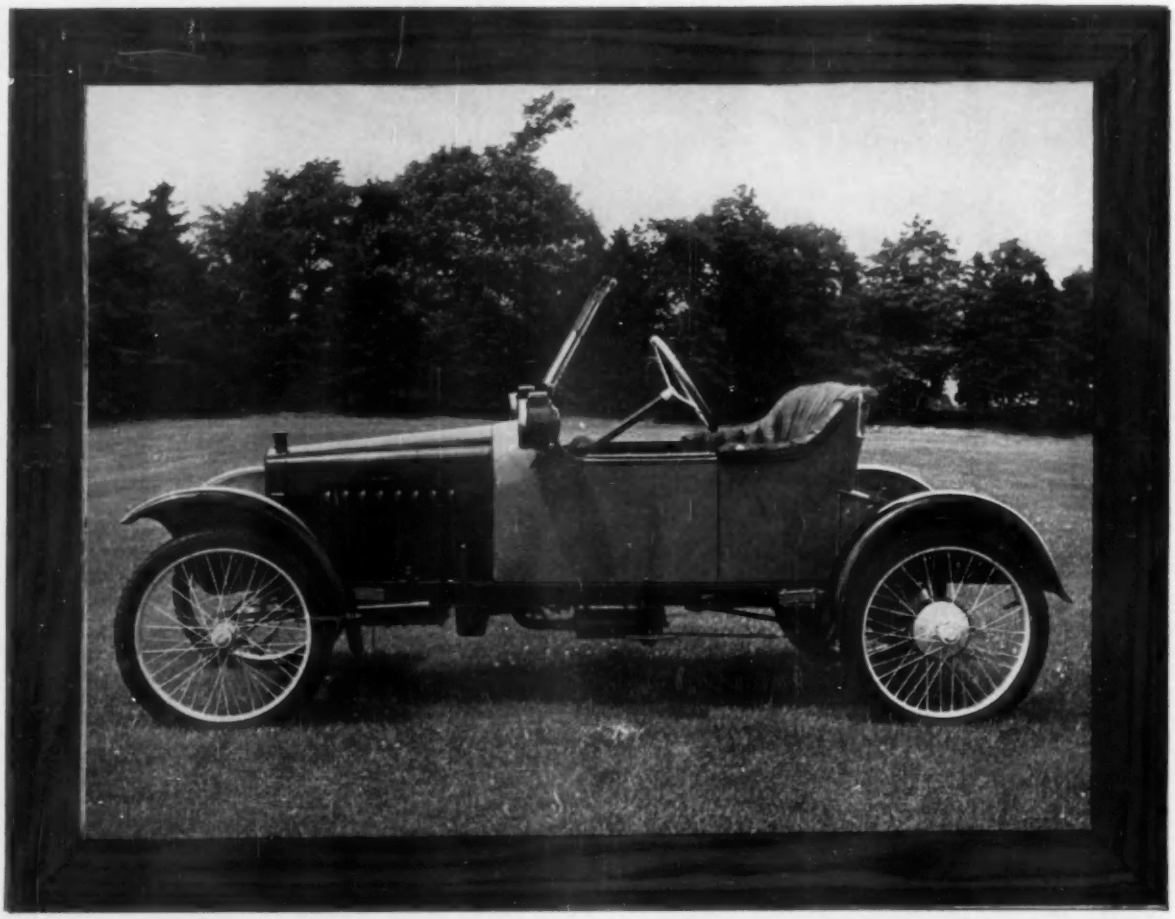
You may have parts that can be produced at significantly lower cost by broaching them the American way. Send part print or sample . . . American engineers will make a recommendation you'll find valuable.

American Catalog 450 is a complete broaching manual . . . write for it today.

AMERICAN **American BROACH & MACHINE CO.**
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

SUNDSTRAND

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



Send for free print—1914 Saxon Runabout, Model A.
Reprinted by permission—P. S. de Beaumont; not for commercial use.

At $395, the 1914 Model A Saxon Runabout was called "the poor man's light car." It had a 96-inch wheelbase, two-speed transmission, and featured standard tread wheels instead of the very narrow ones then in vogue on cyclecars.

This is one of a series of antique automobile prints that will appear in future Morse advertisements. Write for your free copy, suitable for framing. Morse Chain Company, 7601 Central Avenue, Detroit 10, Michigan.

18 out of 22 automobile manufacturers specify Morse Timing Chain Drives

Ever since mechanical horsepower began replacing nature's variety, the Morse Chain Company has supplied the auto industry with its precision-built Timing Chain Drives.

Fact is that today, eighteen out of the twenty-two automotive manufacturers using timing chains, actually *specify* Morse Chain Drives as original equipment.

More than 60,000,000 of these drives have already gone into cars, trucks, and buses—giving vehicle owners long service life, plus freedom from maintenance worries. Morse Timing Chains operate safely, quietly, and smoothly—with positive timing.

Investigate Morse Timing Chain Drives . . . and the other precision-built power transmission products which Morse manufactures. We have expert engineers always available to help you in your power transmission requirements. Write, wire, or phone us, today, for quick assistance on your particular problem.

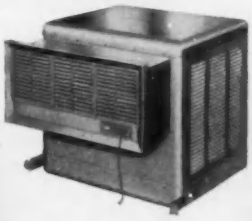
MORSE CHAIN COMPANY: DETROIT, MICHIGAN; ITHACA, NEW YORK.

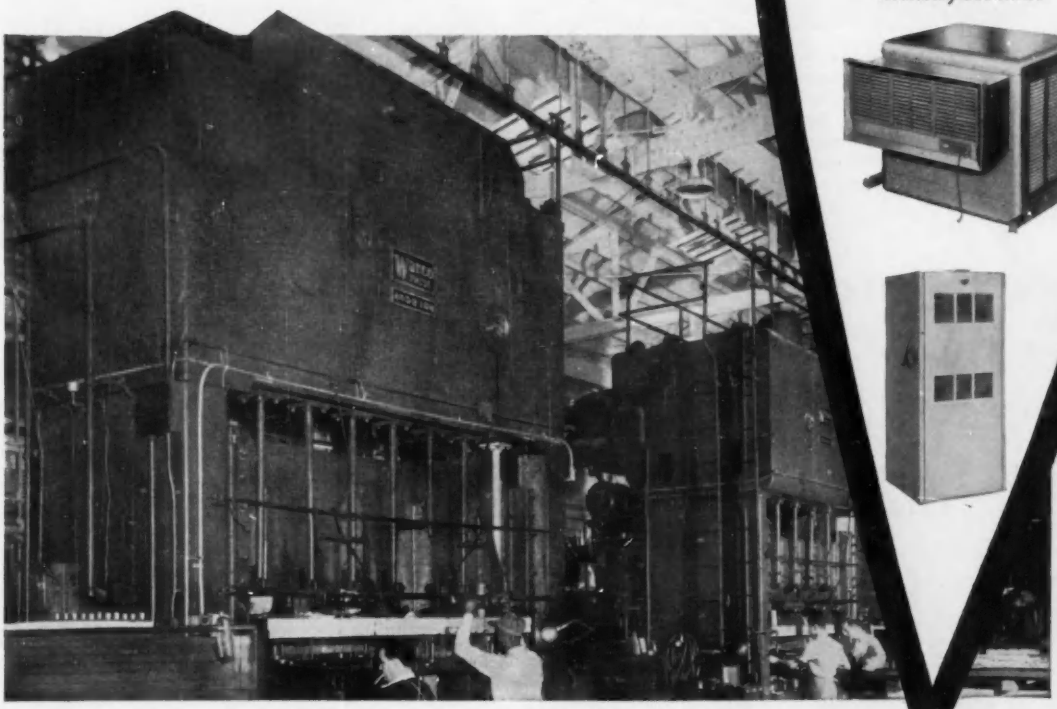
MORSE MORSE B-W *trademark **POWER TRANSMISSION PRODUCTS**

"Warco®

GIVES YOU A LOT FOR YOUR MONEY . . . . .

Says leading west coast appliance manufacturer



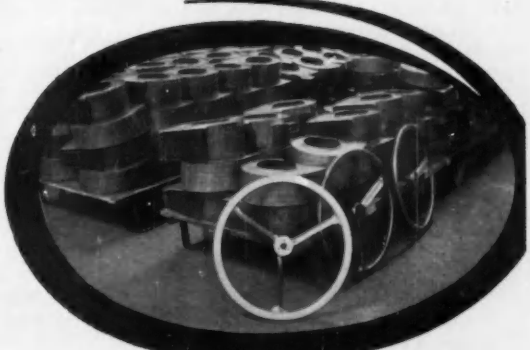


"Rugged, dependable, versatile, well designed," says tool and die head of these Warco Presses.

"I recommended Warco Presses because they are rugged, dependable, versatile and well designed pieces of equipment." This is a statment from John H. Abbott, head of the tool and die department of Utility Appliance Corporation, Los Angeles, one of the west coast's leading appliance manufacturers.

Included in the several Warco Presses now being operated at Utility are two 400-ton and two 250-ton Eccentric Gear Presses that have convinced Utility officials that "Warco Quality" is more than just an advertising phrase.

When next you're considering press equipment, why not let us put you in touch with a Warco user in your area. We believe your first Warco will convert you, too, to "Warco Quality Presses."



Samples of press production at Utility include these centrifugal blower parts.

Federal® WELDERS

Warco® PRESSES

The Federal Machine and Welder Company

WARREN, OHIO

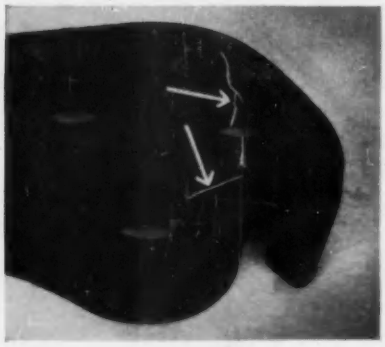
9937

WATCHING YOUR WEIGHT can be important—especially in the aircraft industry. Excess weight can reduce the range and payload of a plane. A major aircraft manufacturer uses M Sonizon units to ultrasonically measure thickness of sheet and formed shapes. This controls weight by eliminating excessive thickness.

Case Studies: NONDESTRUCTIVE TESTING SYSTEMS

Magnaglo and "black light" show up cracks as glowing indications on rough castings at a Peoria, Illinois foundry.

How Nondestructive Testing Helps You Make Better Products . . . Cheaper



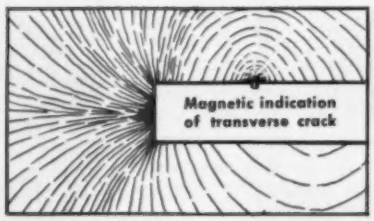
HEAT CRACKED THE JAW—The jaws of steel strapping machines must be reliable. Yet, following the heat treating, invisible cracks were discovered with Magnaglo as shown above. Immediate correction of the heat treat cycle eliminated the cracks. No further machine time or labor was expended on defective jaw parts, since none were made, and none scrapped!!

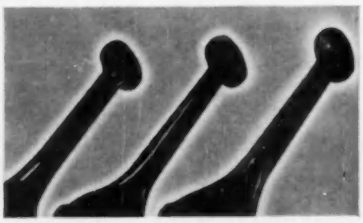
Most manufacturers can achieve definite, worthwhile savings by using one of the M testing systems for improved production control. These nondestructive inspection methods include: Magnaflux, for wet or dry magnetic particle inspection; Magnaglo, fluorescent particle inspection; Magnatest, eddy current electronic testing; Zyglo, fluorescent penetrant inspection; Spotcheck, dye penetrant inspection; Sonizon, for ultrasonic measurements; and others.

The M testing systems are equally effective for preventative maintenance or manufacturing inspection.

Most manufactured products contain one or more types of casting, forging weldment, machined or formed part. Where cracks cannot be tolerated in the final product, maximum production economy must be obtained from the very outset. Defects must be discovered as early as possible in order to eliminate wasted effort in final processing or assembly.

Magnaflux methods pinpoint early defects, and help you eliminate their cause. This results in savings of time, labor and additional long range benefits from increased salvage and reduced amounts of scrap. For detailed information as to how one of the M inspection methods can help you produce better and save more, write or call for an interview with a Magnaflux engineer. No obligation, of course!





HOW MAGNETIC FORCE DETECTS MECHANICAL DEFECTS

M nondestructive testing is based upon simple magnetic principles. A part to be tested is first magnetized—then magnetic powders or fluorescent particles in oil are applied. Surface defects cause a break in the magnetic field—local magnetic poles cause particles to be held on part to mark extent of defect. Above—a Magnaglo indication on truck connecting rods.

HALLMARK OF QUALITY IN NONDESTRUCTIVE TEST SYSTEMS

Write for complete details concerning any of the above case studies, or ask for our new booklet on "Lower Manufacturing Costs."

Take Your Inspection Problems to the House of Answers

MAGNAFLUX CORPORATION

7304 West Lawrence Avenue • Chicago 31, Illinois

New York 36 • Pittsburgh 36 • Cleveland 15 • Detroit 11 • Dallas 19 • Los Angeles 58

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LOS ANGELES 11634 Patton Rd., Downey, TO 2-8163
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NEWARK 1180 Raymond Blvd., MI 2-7586
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SMALL ELECTRIC MOTORS
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American Bosch offers a variety of small, high torque electric motors, precision engineered for quiet power and sturdy dependability. If you have one or a number of small motor requirements in your designs, put the problem up to American Bosch, Springfield 7, Mass. A Division of American Bosch Arma Corporation.

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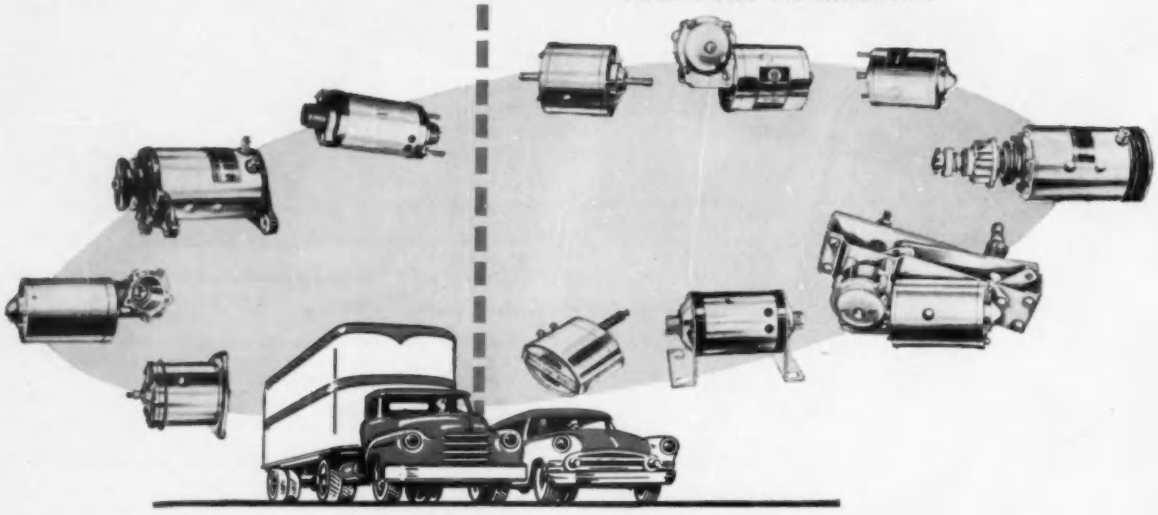
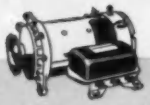
WINDOWS • SEATS • TOPS • HOODS
STARTERS • HEATERS • TRANSMISSIONS
AND AXLE MECHANISMS



AMERICAN BOSCH

Automotive and Aviation Magnetos

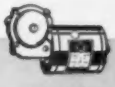


Generators and Regulators

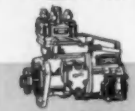
Components for Aircraft Engines

AMERICAN BOSCH

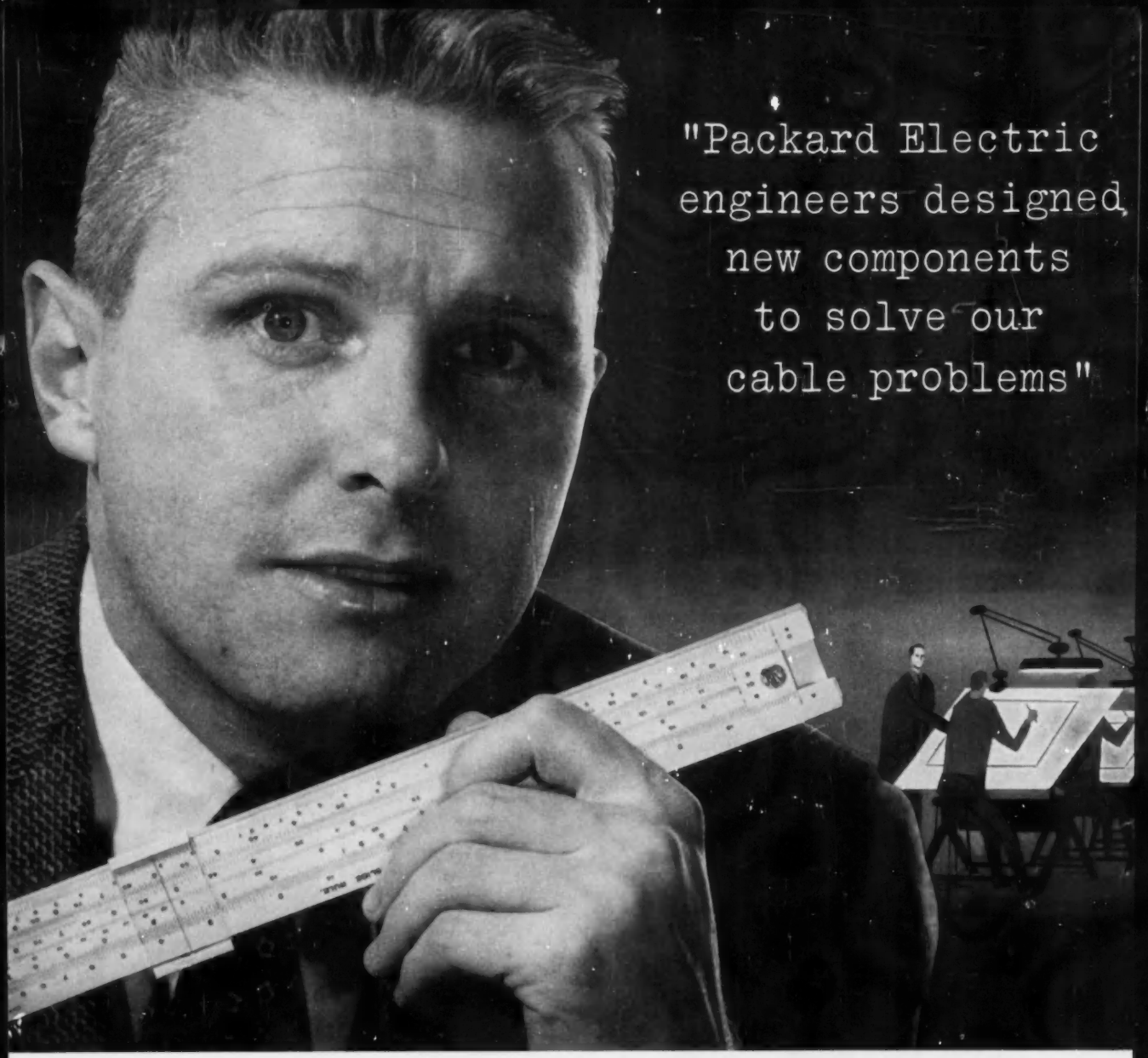
Small Electric Motors



Electric Windshield Wipers



Diesel Fuel Injection Equipment



Sound engineering consultation—and a good product—have made Packard Cable first in sales.

Can our engineers help you?

TO LESSEN IGNITION INTERFERENCE on radio, TV and other communication devices, Packard Electric developed a new, high-tension cable built with non-metallic conductor. This new cable suppresses electrical oscillations throughout the length of the circuit instead of only at one point as was previously possible.

FOR CABLE SUBJECTED TO ABRASION, weathering and other deteriorating elements, Packard Electric developed a new type plastic exterior insulation which not only *works* better but *looks* better on truck, tractor, boat and other engines.

PACKARD ENGINEERING WORKS FOR YOU in many ways. Whether you need a new cable component or a complex wiring harness, ready for snap-in installation—it will pay you to discuss the problem with us. Because we know the business *from the inside out* . . . more Packard Electric cable is used as original automotive equipment than all other makes combined.

GM GENERAL MOTORS

Packard

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When you want the best technical assistance "on your team," *use Bonderite under the paint*

Parker technical representatives average 12 years on the job.

The Parker technical representative who lives in and covers your area has a solid background of experience—an average of 12 years on the job!

● Many people tell us this is one of the most important things we have to sell, even though it doesn't cost our customers a red cent.

It's the knowledge and experience our organization has built since the introduction in 1929 of Bonderite, the first corrosion resistant paint base. It's the competence and practical understanding of our technical representatives. It's the cooperative attitude of our Customer Service people. It's the initiative and ability of our Research staff.

When you use Bonderite on your product, all these people go on your team to see that you get best results with greatest economy.

Want these good men on your side? Write Parker today!

**Bonderite, Bonderlube, Parco, Parco Lubrite, Parker Pre-Namel—Reg. U.S. Pat. Off.*

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BONDERITE	BONDERITE and BONDERLUBE	PARCO COMPOUND	PARCO LUBRITE	TROPICAL
corrosion resistant paint base	aids in cold forming of metals	rust resistant	wear resistant for friction surfaces	heavy duty maintenance paints since 1883

"IT'S BETTER IF IT CONTAINS MOLY"

See what adhesives are doing today!

A 3M ADHESIVE FASTENS DOWN THIS RUBBER MAT FOR KEEPS. IT'S CLEAN, QUICK AND EASY, MAKES NO MESS IN THE CAB INTERIOR.

Dressing up the "doghouse"

How would you fasten the trim on this truck engine cover? The fastener must fight heat, stress and vibration. And it has to be able to hold this rubber mat tight year after year, for hundreds of thousands of punishing miles.

Yet a 3M adhesive does the job. This worker quickly brushes EC-882 on the painted "doghouse", presses the rubber mat in place. High-strength, fast-drying EC-882 grips immediately and for keeps. In addition, EC-882 bonds rubber weather strip to the cab's enameled doors and door frames.

Another 3M adhesive, EC-871, fastens fibrous glass insulation to the cab roof and vinyl-coated jute to back and side panels. After 15 years of using 3M adhesives, this manufacturer can't recall one case of adhesive failure.

SEE WHAT ADHESIVES CAN DO FOR YOU! Hundreds of 3M adhesives serve many varied industries. Consult 3M research. Call your 3M Field Engineer. For a free booklet and information write: 3M, Dept. 316, 417 Piquette Ave., Detroit 2, Mich.

PRODUCT OF 3M RESEARCH

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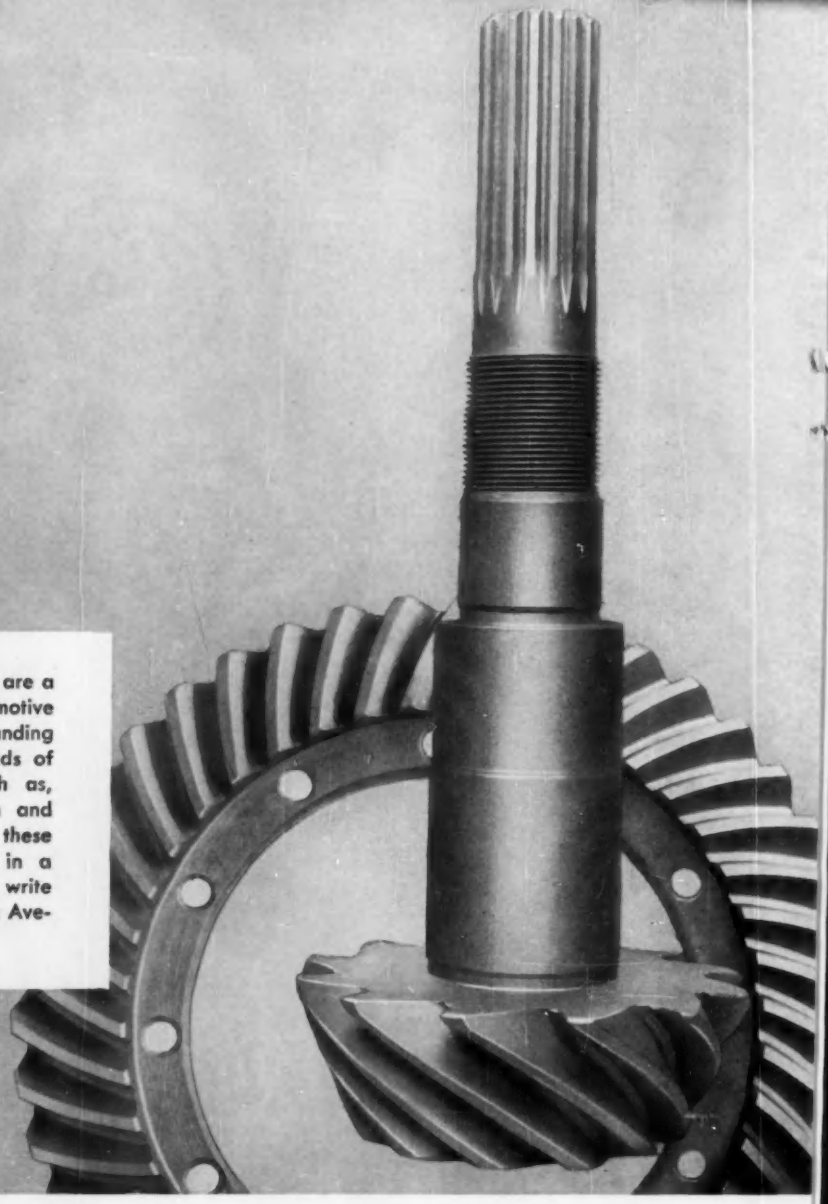
"IT'S BETTER IF IT CONTAINS MOLY"



Moly carburizing steels with 0.5% Mo are a natural for components like this automotive ring-gear and pinion. They have outstanding properties that suit them to the demands of gearing and similar applications, such as, superior case hardness, low distortion and good machinability. Many features of these new carburizing steels are discussed in a recent technical article. For a reprint, write Climax Molybdenum Company, 500 Fifth Avenue, New York 36, N. Y., Dept. 4.

Molybdenum Carburizing Steels

MOLYBDENUM OFFERS THE ECONOMICAL KEY TO PERFORMANCE

Over the years, molybdenum carburizing steels have proved their merits in scores of applications and at every level of production.

Design engineers know moly steels for their uniform hardenability, toughness and wear resistance.

Production men know that moly steels are easy to heat treat, easy to machine.

Management knows that moly steels mean economy in fabrication, high performance in a wide range of end products.

Standard molybdenum carburizing steels are widely available. Higher moly analyses may be ordered in heat lots from a number of leading suppliers.

CLIMAX MOLYBDENUM

Get your brake or transmission idea "off the board and on the road"...faster!
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Why American Brakeblok can slash time and still meet toughest specs

Research: Your new friction engineering problems may already be solved, or are well on the way to solution. Hundreds of formulas for asbestos-base, semi-metallic and metallic friction materials have been developed by our research staff, and are ready now for tomorrow's needs.

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Production: Three modern plants in the U. S. A. can meet the needs of millions of vehicles and machines every year. Point-by-point production, precisely controlled, insures top quality of every part.

Service: Sales engineers are your liaison with ABB. They know their field, and are at your disposal—virtually members of your project team. Even when design changes in midstream, they can shift ABB to meet the new requirements immediately.

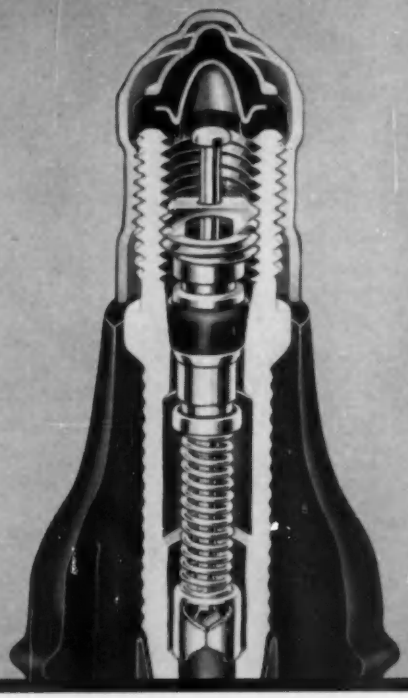
• • •

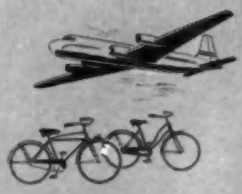
To take full advantage of these American Brakeblok facilities, we suggest you check with us during your initial planning stage. A call or letter will bring immediate action.

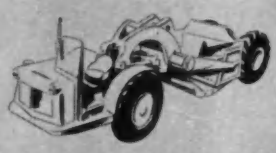
American Brake Shoe Company

AMERICAN BRAKEBLOK DIVISION
DETROIT 9, MICHIGAN

LOOK TO SCHRADER...







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for all types of
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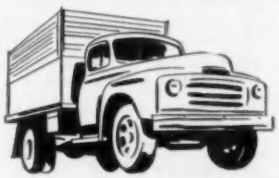

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ORIGINAL EQUIPMENT AND REPLACEMENT

Keeps its dependability

The Westinghouse Weld-O-Timer*. . . with extra long-lived components

For instance, in the new Weld-O-Timer, 600-volt capacitors are used even though circuit voltage is only 150 volts. Relays, interchangeable between solenoid and firing control, are also of long-lasting construction. Each control panel element is rated for heavy-duty industrial work.

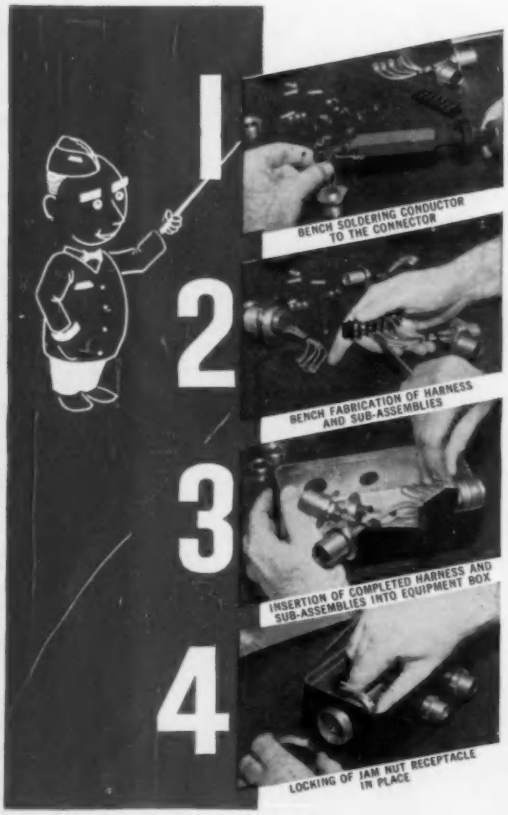
And you get instant protection from high operating heat with the snap-on Ignitron tube thermostat plus improved welder efficiency. Everything about this new resistance welding control means greater production, less down time, and more dependability. For all the facts, call your Westinghouse sales engineer. Or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21945

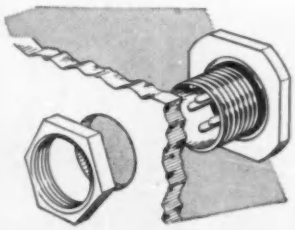
This new Westinghouse Ignitron tube protects from high operating heat and conserves cooling water. Inside shell of water jacket contacts copper strip on outer jacket. Thermostatic switch (circled) shuts off current if dangerous heat builds up.

*Trade-Mark

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING **TODAY!***


1
2
3
4
BENCH SOLDERING CONDUCTOR TO THE CONNECTOR
BENCH FABRICATION OF HARNESS AND SUB-ASSEMBLIES
INSERTION OF COMPLETED HARNESS AND SUB-ASSEMBLIES INTO EQUIPMENT BOX
LOCKING OF JAM NUT RECEPTACLE IN PLACE



Bendix

JAM NUT RECEPTACLES

Easy to install, to service, to replace

Jam nut receptacles offer such positive savings in assembly time that it will pay you to check into their application on your product. These receptacles permit bench wiring of harness and sub-assemblies prior to final installation with proven savings in assembly labor.

Just consider these design advantages—only one mounting hole required per receptacle—no extra gasket required—no user problem of sealing around screw holes—no extra hardware necessary such as screws, washers or nuts.

Write for complete detailed specifications

Bendix **SCINTILLA DIVISION**
SIDNEY, NEW YORK
Bendix AVIATION CORPORATION

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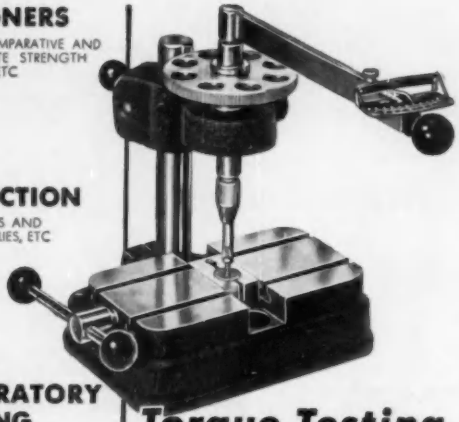

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A universal fixture with 1000 uses. Holds driver in accurate alignment; in instrument bearings. Provides rapid engagement with test sample...torque is applied and measured with Sturtevant Torque Wrench.

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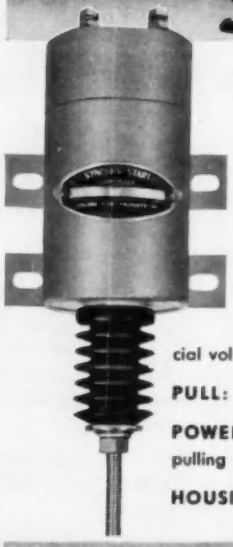
HEAVY DUTY DC *Solenoids*



Synchro-Start MODEL SD SOLENOID has been developed to meet heavy duty requirements. It has an exceptional amount of power over a long stroke. The SD Solenoid is fully enclosed in a sealed case protecting it from infiltration of dust and liquids.

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POWER CONSUMPTION: 550 Watts pulling and 8 Watts holding.

HOUSING DIMENSIONS: 4⅛" x 2½".

SYNCHRO-START PRODUCTS
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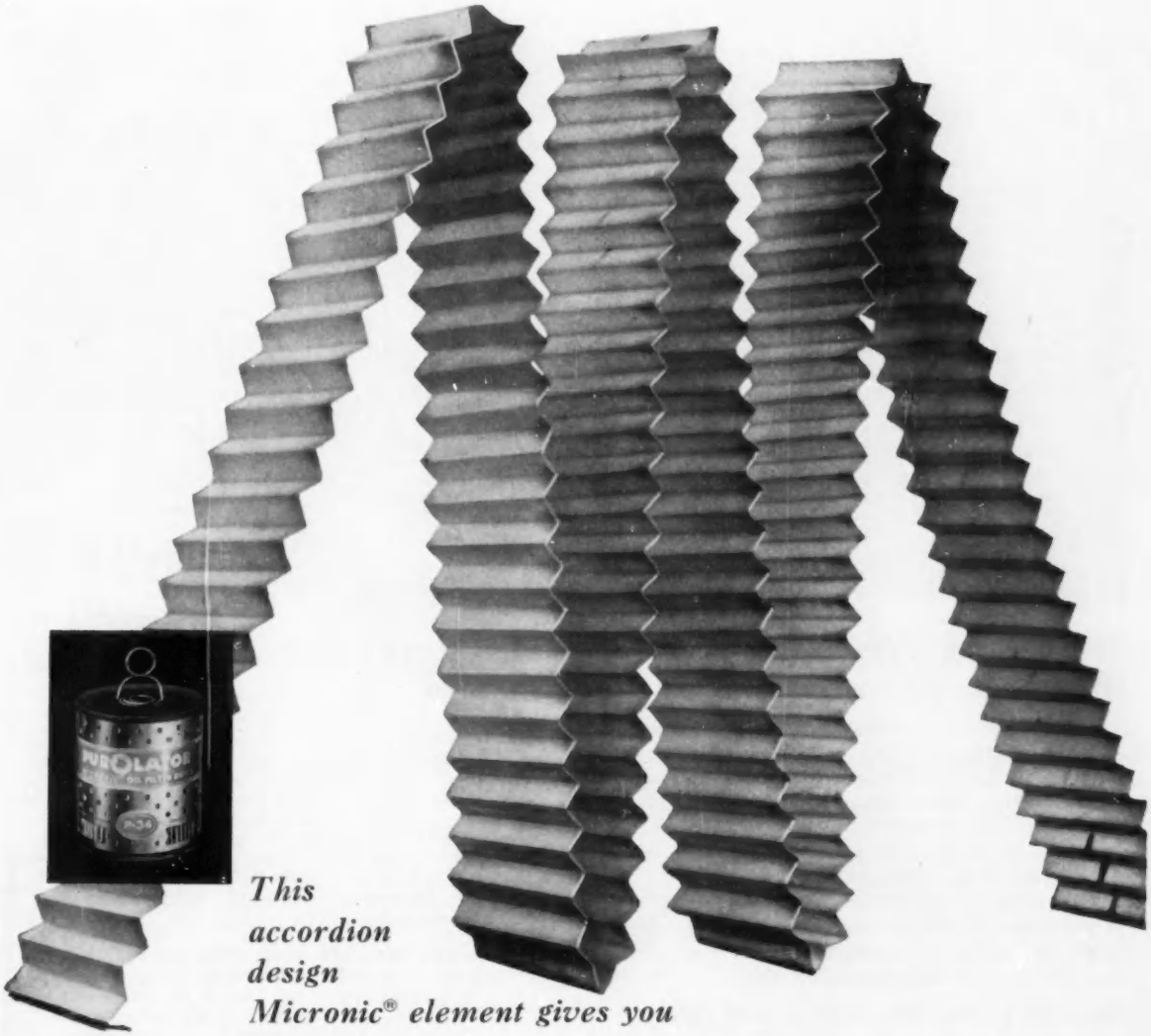
8151 N. RIDGEWAY AVE. • SKOKIE, ILL.



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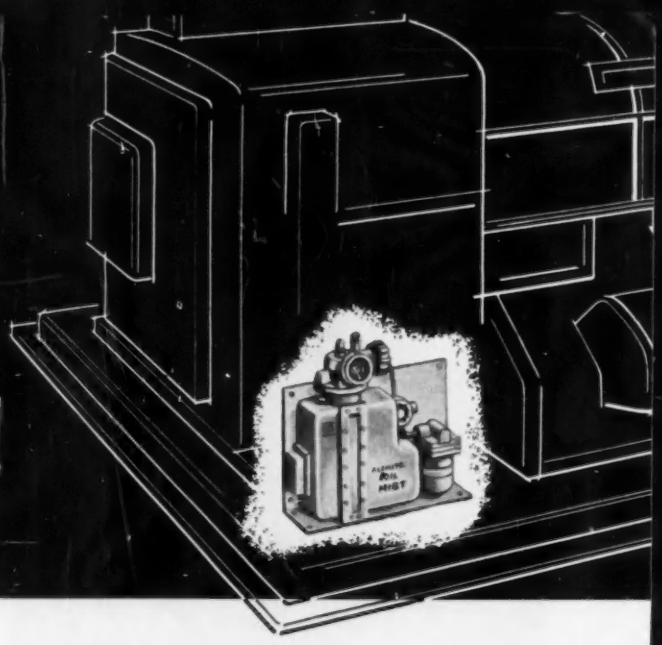

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multiplies bearing life... cuts product spoilage ...boosts machine output in almost every industry!

Alemite Oil-Mist Automatic Lubrication brings remarkable savings . . . in lubricants, man-hours, bearing life, and decreased product spoilage.

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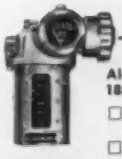

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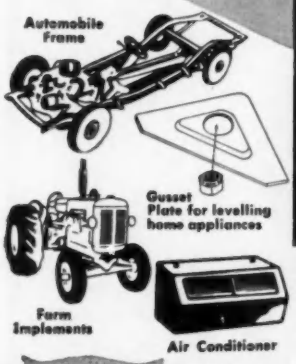

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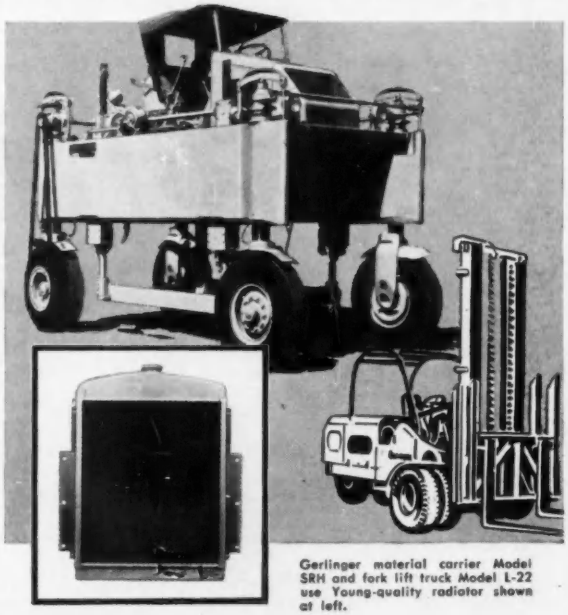
cool the engines that power the "muscles" of Gerlinger weight lifters and carriers



Gerlinger material carrier Model SRH and fork lift truck Model L-22 use Young-quality radiator shown at left.

Young engine-cooling radiators tailored for every automotive application

Young radiators are used wherever the going is tough. So, when a Gerlinger material carrier loads up with 30,000 lbs., or a fork lift truck hoists and maneuvers a half dozen or more tons, powerful engines have to be kept cool! Here is where Young radiators prove their quality. On Gerlinger equipment, as well as on many others, Young radiators provide the specific answers to heat transfer problems. Patented features insure maximum heat transfer and give Young cores a dependable ruggedness. In the automotive field Young produces radiators to cool lube oil or torque converter fluid and engine jacket water.

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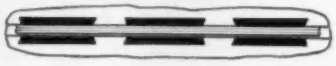
PERMA-GROOVE*

WITH SEGMENTAL STEEL TOP RING SECTION

TOP RING SECTION



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1. Individual steel segments eliminate continuous band expansion problem.
2. Segments securely locked to prevent radial movement.
3. Dovetailed edges keep steel segments securely in plane with groove.
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5. 25% aluminum bearing area for heat conductivity and cool operation.
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PRECISION PRODUCTION

COOPERATION WITH ENGINE BUILDERS

ZOLLNER PISTONS

THE ORIGINAL EQUIPMENT PISTONS

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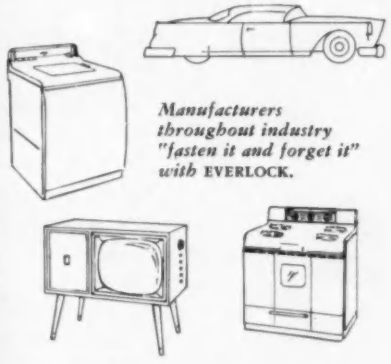

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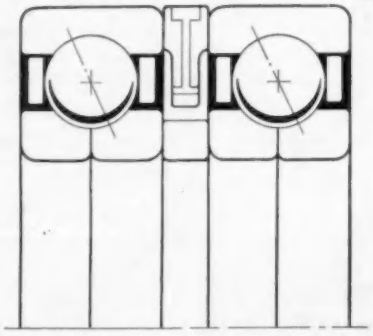

Matched sets of New Departure split inner ring bearings are made with great accuracy to assure equal distribution of the heavy thrust loads developed by modern aircraft engines.

New Departure is bringing to bear the most extensive facilities in the industry for the research, development, testing and production of ball bearings for jet and turboprop engines . . . bearings made of heat-stabilized ball bearing steel and special high-temperature alloys for maximum service at elevated temperatures and high speeds . . . ball bearings designed to operate under adverse conditions of lubrication . . . bearings fully capable of taking the heavy thrust loads existing in high-performance jet and turboprop engines.

Indication of New Departure's knowledge and experience in the production of the specialized bearings required for modern aircraft performance is the split inner ring types shown above, being made for all the major jet engine manufacturers in America.

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